

SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: JOHN MAPLES Examiner #: 62294 Date: 10/24/02
 Art Unit: 1745 Phone Number 30 8-1795 Serial Number: 09/701,950
 Mail Box and Bldg/Room Location: CPAE 3-8 Results Format Preferred (circle): PAPER DISK E-MAIL
E12

If more than one search is submitted, please prioritize searches in order of need.

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: METHOD FOR PRODUCING POSITIVE ELECTRODE ACTIVE MATERIAL FOR PRODUCING NON-AQUEOUS ELECTROLYTE SECONDARY BATTERY

Inventors (please provide full names):
GUOHUA LI, ATSUGO YAMADA, HIROTO AZUMA

Earliest Priority Filing Date: 4/6/1999

For Sequence Searches Only Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.

A METHOD FOR PRODUCING A POSITIVE ACTIVE MATERIAL
 COMPRISING MIXING A PLURALITY OF SUBSTANCES TO GIVE A
 PRECURSOR, SINTERING THE PRECURSOR AND THEN FORMING
 $Li_x M_y PO_4$, WHERE $0 < x \leq 2$, $0.8 \leq y \leq 1.2$
 AND M IS AT LEAST ONE 3d TRANSITION METAL.

SPECIFIC
EXS. $M = Fe$
 $M = Fe, Mn$

Also: IN MIXING STEP, A REDUCING AGENT CAN BE ADDED, AND/OR
 DE-AERATING STEP CAN OCCUR, AND/OR A CONDUCTIVE AGENT CAN BE ADDED TO
 SAID PRECURSOR.

STAFF USE ONLY

	Type of Search	Vendors and cost where applicable
Searcher: <u>EJ</u>	NA Sequence (#) _____	STN <u>\$ 138.43</u>
Searcher Phone #: _____	AA Sequence (#) _____	Dialog _____
Searcher Location: _____	Structure (#) <u>(4)</u>	Questel/Orbit _____
Date Searcher Picked Up: _____	Bibliographic <u>(6)</u>	Link _____
Date Completed: <u>10-29-02</u>	Litigation _____	Lexis/Nexis _____
Searcher Prep & Review Time: <u>5</u>	Fulltext _____	Sequence Systems _____
Clerical Prep Time: _____	Patent Family _____	WWW/Internet _____
Online Time: <u>75</u>	Other _____	Other (specify) _____

=> file reg

FILE 'REGISTRY'

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FILE 'REGISTRY'

L1 7347 SEA (LI(L)P(L)O)/ELS
L2 2448 SEA L1 AND (T1 OR T2 OR T3)/PG
L3 991 SEA L2 AND O4P
L4 390 SEA L2 AND FE/ELS
L5 62 SEA L4 AND MN/ELS
L6 188 SEA L3 AND L4
L7 45 SEA L3 AND L5
L8 6 SEA L6 AND 4/ELC.SUB
L9 21 SEA L7 AND 5/ELC.SUB
L10 20 SEA L9 AND 4/NC
L11 5 SEA L8 AND 3/NC

FILE 'HCA'

L12 64 SEA L10
L13 12 SEA L11
L14 208062 SEA (POS# OR POSITIV?)(2A)ELECTROD## OR CATHOD##
L15 42332 SEA NONAQ# OR NONAQUEOUS? OR NONH2O OR NONWATER? OR
NON(2A)(AQ# OR AQUEOUS? OR WATER? OR H2O)
L16 174136 SEA BATTERY OR BATTERIES OR (ELECTROCHEM? OR ELECTROLY?
OR GALVANI? OR WET OR DRY OR PRIMARY OR SECONDARY)(2A)(CE
LL OR CELLS) OR WETCELL? OR DRYCELL?
L17 389734 SEA ELECTROLY?
L18 19 SEA L12 AND (L14 OR L15 OR L16 OR L17 OR 52/SC,SX OR
72/SX,SC)
L19 12 SEA L13 AND (L14 OR L15 OR L16 OR L17 OR 52/SC,SX OR
72/SX,SC)
L20 18 SEA L12 AND (L15 OR L16 OR L17)
L21 17 SEA L12 AND L14
L22 17 SEA L20 AND L21
L23 12 SEA L13 AND (L15 OR L16 OR L17)
L24 12 SEA L13 AND L14
L25 12 SEA L23 AND L24

FILE 'REGISTRY'

L26 114 SEA L3 AND 4/ELC.SUB
L27 43 SEA L26 AND 3/NC
L28 43 SEA L27 AND 0<LI<=2.0

FILE 'HCA'

L29 44 SEA L28
L30 28 SEA L29 AND L14

L31 27 SEA L29 AND (L15 OR L16 OR L17)
 L32 27 SEA L30 AND L31
 L33 QUE REDUC? OR REDN#
 L34 16426 SEA DEAERAT? OR DEOXYGENAT? OR DE(A) (AERIF? OR AERAT? OR
 OXYGENAT?) OR DEAERIF?
 L35 QUE COND# OR CONDUCT? OR SUPERCOND?
 L36 5 SEA L32 AND L33
 L37 0 SEA L32 AND L34
 L38 5 SEA L32 AND L35
 L39 1 SEA L36 AND L38
 L40 440 SEA L3
 L41 110 SEA L40 AND L14
 L42 37 SEA L40 AND L15
 L43 187 SEA L40 AND (L16 OR L17 OR 52/SC,SX OR 72/SC,SX)
 L44 15 SEA (L41 OR L42 OR L43) AND L33
 L45 0 SEA (L41 OR L42 OR L43) AND L34
 L46 98 SEA (L41 OR L42 OR L43) AND L35
 L47 7 SEA L44 AND L46
 L48 1610 SEA L2
 L49 1 SEA L48 AND L34
 L50 137 SEA L48 AND L33
 L51 359 SEA L48 AND L35
 L52 22 SEA L50 AND L51
 L53 13 SEA L52 AND (L14 OR L15 OR L16 OR L17 OR 52/SC,SX OR
 72/SC,SX)
 L54 16 SEA L36 OR L38 OR L39 OR L47 OR L49
 L55 19 SEA (L19 OR L25 OR L44 OR L53) NOT L54
 L56 15 SEA (L18 OR L22) NOT (L54 OR L55)
 L57 9 SEA L32 NOT (L54 OR L55 OR L56)

=> file hca

FILE 'HCA'

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=> d l54 1-16 cbib abs hitstr hitind

L54 ANSWER 1 OF 16 HCA COPYRIGHT 2002 ACS

137:127489 Electrochemical properties of lithium vanadium phosphate as a
cathode material for lithium-ion **batteries**.

Saidi, M. Y.; Barker, J.; Huang, H.; Swoyer, J. L.; Adamson, G.
 (Valence Technology, Incorporated, Henderson, NV, 89015, USA).

Electrochemical and Solid-State Letters, 5(7), A149-A151 (English)

2002 CODEN: ESLEF6. ISSN: 1099-0062. Publisher: Electrochemical
 Society.

AB The properties of the monoclinic lithium vanadium phosphate
 $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ are investigated using x-ray diffraction and
 electrochem. methods. Electrochem. measurements **conducted**
 in half-cells with $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ as the **cathode** material and

lithium metal as the anode have shown that this material exhibits an excellent reversibility when the charge extd. is confined to that equiv. to two lithiums per formula unit. The extn. of the last lithium is obsd. at a potential >4.6 V vs. Li/Li+ and involves a significant overvoltage. Upon discharge, however, x-ray diffraction has shown that the original structure is recovered.

IT 204653-30-5, Lithium vanadium phosphate [Li₃V₂(PO₄)₃]
(electrochem. properties of lithium vanadium phosphate as
cathode material for lithium-ion **batteries**)
RN 204653-30-5 HCA
CN Lithium vanadium phosphate (Li₃V₂(PO₄)₃) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST lithium vanadium phosphate **cathode battery**
IT **Battery cathodes**

(electrochem. properties of lithium vanadium phosphate as
cathode material for lithium-ion **batteries**)
IT 204653-30-5, Lithium vanadium phosphate [Li₃V₂(PO₄)₃]
(electrochem. properties of lithium vanadium phosphate as
cathode material for lithium-ion **batteries**)

L54 ANSWER 2 OF 16 HCA COPYRIGHT 2002 ACS

137:8642 Methods of making lithium metal compounds useful as
cathode active materials in **batteries**. Barker,
Jeremy; Yazid, Saidi M.; Swoyer, Jeffrey L. (Valence Technology,
Inc., USA). PCT Int. Appl. WO 2002044084 A2 20020606, 85 pp.
DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR,
BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI,
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ,
LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ,
OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ,
UA, UG, US, UZ, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ,
TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR,
GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR.
(English). CODEN: PIXXD2. APPLICATION: WO 2001-US43633 20011119.
PRIORITY: US 2000-724085 20001128.

AB The invention provides a novel method for making lithium mixed metal
materials for **battery cathodes**. The lithium
mixed metal materials comprise lithium and at least one other metal
besides lithium. The invention involves the reaction of a metal
compd., a phosphate compd., with a **reducing** agent to
reduce the metal and form a metal phosphate. The invention
also includes methods of making lithium metal oxides involving
reaction of a lithium compd. and a metal oxide with a
reducing agent.

IT 204653-30-5P, Lithium vanadium phosphate $\text{Li}_3\text{V}_2(\text{PO}_4)_3$
 (methods of making lithium metal compds. useful as
cathode active materials in **batteries**)
 RN 204653-30-5 HCA
 CN Lithium vanadium phosphate ($\text{Li}_3\text{V}_2(\text{PO}_4)_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

IC ICM C01B025-00
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 49
 ST **battery cathode** lithium metal compd prepn
 IT **Reduction**
 (carbothermic; methods of making lithium metal compds. useful as
cathode active materials in **batteries**)
 IT **Secondary batteries**
 (lithium; methods of making lithium metal compds. useful as
cathode active materials in **batteries**)
 IT **Battery cathodes**
 Thermite process
 (methods of making lithium metal compds. useful as
cathode active materials in **batteries**)
 IT 7664-38-2D, Phosphoric acid, transition metal compds. 7722-76-1,
 Ammonium dihydrogen phosphate 7757-87-1, Magnesium phosphate
 $\text{Mg}_3(\text{PO}_4)_2$ 7779-90-0, Zinc phosphate $\text{Zn}_3(\text{PO}_4)_2$ 7783-28-0,
 Diammonium hydrogen phosphate 7789-04-0, Chromium phosphate CrPO_4
 7789-24-4, Lithium fluoride, processes 10045-86-0, Iron phosphate
 FePO_4 13453-80-0, Lithium dihydrogen phosphate 14154-09-7,
 Manganese phosphate $\text{Mn}_3(\text{PO}_4)_2$ 14940-41-1, Iron phosphate $\text{Fe}_3(\text{PO}_4)_2$
 70172-55-3, Titanium phosphate TiPO_4
 (methods of making lithium metal compds. useful as
cathode active materials in **batteries**)
 IT 7664-38-2DP, Phosphoric acid, lithiated transition metal compds.
 12162-92-4P, Lithium vanadium oxide LiV_2O_5 15365-14-7P, Iron
 lithium phosphate FeLiPO_4 204653-30-5P, Lithium vanadium
 phosphate $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ 349632-76-4P, Iron lithium magnesium
 phosphate ($\text{Fe}_{0.9}\text{LiMg}_{0.1}(\text{PO}_4)$) 372075-82-6P, Lithium manganese
 fluoride phosphate LiMnFPO_4 372075-83-7P, Lithium vanadium
 fluoride phosphate ($\text{LiVF}(\text{PO}_4)$) 372075-84-8P, Chromium lithium
 fluoride phosphate CrLiFPO_4 372075-85-9P, Lithium titanium
 fluoride phosphate LiTiFPO_4 372075-86-0P 372075-87-1P, Iron
 lithium fluoride phosphate FeLiFPO_4 433708-98-6P, Copper lithium
 fluoride phosphate ($\text{CuLiF}(\text{PO}_4)$) 433708-99-7P, Cobalt lithium
 fluoride phosphate ($\text{CoLiF}(\text{PO}_4)$) 433709-00-3P, Lithium nickel
 fluoride phosphate ($\text{LiNiF}(\text{PO}_4)$) 433709-01-4P, Iron lithium
 magnesium phosphate ($\text{Fe}_{0.67}\text{LiMg}_{0.33}(\text{PO}_4)$)
 (methods of making lithium metal compds. useful as

- cathode** active materials in **batteries**)
- IT 1333-74-0, Hydrogen, reactions
(methods of making lithium metal compds. useful as
cathode active materials in **batteries**)
- IT 124-38-9, Carbon dioxide, uses 630-08-0, Carbon monoxide, uses
7440-37-1, Argon, uses 7727-37-9, Nitrogen, uses
(methods of making lithium metal compds. useful as
cathode active materials in **batteries**)
- IT 7440-44-0, Carbon, reactions
(**reducing** agent; methods of making lithium metal
compds. useful as **cathode** active materials in
batteries)
- L54 ANSWER 3 OF 16 HCA COPYRIGHT 2002 ACS
- 136:297382 Carbon-coated or carbon-crosslinked redox materials with
transition metal-lithium oxide core for use as **battery**
electrodes. Armand, Michel; Gauthier, Michel; Magnan,
Jean-Francois; Ravet, Nathalie (Hydro-Quebec, Can.). PCT Int. Appl.
WO 2002027824 A1 20020404, 78 pp. DESIGNATED STATES: W: AE, AG,
AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID,
IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA,
MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG,
SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM,
AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI,
CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE,
NL, PT, SE, SN, TD, TG, TR. (French). CODEN: PIXXD2. APPLICATION:
WO 2001-CA1350 20010921. PRIORITY: CA 2000-2320661 20000926.
- AB Carbon-coated redox materials suitable for use in **battery**
electrodes consist of a core surrounded by a coating, or
interconnected by carbon crosslinks, in which the core includes a
compn. of formula $\text{Li}_x\text{M}_1\text{-yM}'\text{y}(\text{XO}_4)_n$, in which $y = 0\text{-}0.6$, $x = 0\text{-}2$, $n =$
 $0\text{-}1.5$; M is a transition metal; and M' is a element of fixed valence
selected from Mg^{2+} , Ca^{2+} , Al^{3+} , and Zn^{2+} , and X is S, P, and Si.
Synthesis of the materials is carried out by reacting a balanced
mixt. of appropriate precursors in a **reducing** atm., to
adjust the valence of the transition metals, in the presence of a
carbon source, which is then pyrolyzed. The resulting products
exhibit an excellent elec. **cond.** and a highly enhanced
chem. activity.
- IT 407640-63-5, Iron lithium titanium phosphate sulfate
($\text{Fe}_{0.85}\text{Li}_{1.35}\text{Ti}_{0.15}(\text{PO}_4)_0.5(\text{SO}_4)$)
(electrodes contg.; carbon-coated or carbon-crosslinked redox
materials with transition metal-lithium oxide core for use as
battery electrodes)
- RN 407640-63-5 HCA
- CN Iron lithium titanium phosphate sulfate
($\text{Fe}_{0.85}\text{Li}_{1.35}\text{Ti}_{0.15}(\text{PO}_4)_0.5(\text{SO}_4)$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		

O4S	1	14808-79-8
O4P	0.5	14265-44-2
Ti	0.15	7440-32-6
Li	1.35	7439-93-2
Fe	0.85	7439-89-6

IT 213467-46-0, Iron lithium manganese phosphate
(FeLi₂Mn(PO₄)₂)
(electrodes contg.; carbon-coated or carbon-crosslinked redox
materials with transition metal-lithium oxide core for use as
battery electrodes)

RN 213467-46-0 HCA

CN Iron lithium manganese phosphate (FeLi₂Mn(PO₄)₂) (9CI) (CA INDEX
NAME)

Component	Ratio	Component Registry Number
=====		
O4P	2	14265-44-2
Mn	1	7439-96-5
Li	2	7439-93-2
Fe	1	7439-89-6

IT 407640-52-2, Iron lithium manganese phosphate
(Fe_{0.1-1}LiMn_{0-0.9}(PO₄)) 407640-53-3, Iron lithium
magnesium phosphate (Fe_{0.7-1}LiMg_{0-0.3}(PO₄)) 407640-54-4,
Calcium iron lithium phosphate (Ca_{0-0.3}Fe_{0.7-1}Li(PO₄))
407640-55-5 407640-56-6, Iron lithium phosphate
silicate (FeLi_{1-1.9}(PO₄)_{0.1-1}(SiO₄)_{0-0.9}) 407640-58-8,
Iron lithium manganese phosphate sulfate (Fe₀₋₁Li_{1-1.2}Mn_{0-0.2}[(PO₄), (SO₄)]₁)
407640-59-9, Iron lithium manganese
phosphate ((Fe,Mn)Li_{1-1.6}(PO₄)) 407640-60-2, Iron lithium
manganese phosphate sulfate (Fe₁₋₂Li₁₋₂Mn₀₋₁[(PO₄), (SO₄)]₁)
407640-61-3, Iron lithium titanium phosphate
((Fe,Ti)Li_{0.5-2}(PO₄)_{1.5})
(metal source; carbon-coated or carbon-crosslinked redox
materials with transition metal-lithium oxide core for use as
battery electrodes)

RN 407640-52-2 HCA

CN Iron lithium manganese phosphate (Fe_{0.1-1}LiMn_{0-0.9}(PO₄)) (9CI) (CA
INDEX NAME)

Component	Ratio	Component Registry Number
=====		
O4P	1	14265-44-2
Mn	0 - 0.9	7439-96-5
Li	1	7439-93-2
Fe	0.1 - 1	7439-89-6

RN 407640-53-3 HCA

CN Iron lithium magnesium phosphate (Fe_{0.7-1}LiMg_{0-0.3}(PO₄)) (9CI) (CA

INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	1	14265-44-2
Mg	0 - 0.3	7439-95-4
Li	1	7439-93-2
Fe	0.7 - 1	7439-89-6

RN 407640-54-4 HCA

CN Calcium iron lithium phosphate (Ca0-0.3Fe0.7-1Li(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	1	14265-44-2
Ca	0 - 0.3	7440-70-2
Li	1	7439-93-2
Fe	0.7 - 1	7439-89-6

RN 407640-55-5 HCA

CN Iron lithium magnesium manganese phosphate (Fe0-1LiMg0-0.2Mn0-1(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	1	14265-44-2
Mn	0 - 1	7439-96-5
Mg	0 - 0.2	7439-95-4
Li	1	7439-93-2
Fe	0 - 1	7439-89-6

RN 407640-56-6 HCA

CN Iron lithium phosphate silicate (FeLi1-1.9(PO4)0.1-1(SiO4)0-0.9) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4Si	0 - 0.9	17181-37-2
O4P	0.1 - 1	14265-44-2
Li	1 - 1.9	7439-93-2
Fe	1	7439-89-6

RN 407640-58-8 HCA

CN Iron lithium manganese phosphate sulfate (Fe0-1Li1-1.2Mn0-0.2[(PO4),(SO4)]) (9CI) (CA INDEX NAME)

Component	Ratio	Component
-----------	-------	-----------

		Registry Number
=====	=====	=====
O4S	0 - 1	14808-79-8
O4P	0 - 1	14265-44-2
Mn	0 - 0.2	7439-96-5
Li	1 - 1.2	7439-93-2
Fe	0 - 1	7439-89-6

RN 407640-59-9 HCA

CN Iron lithium manganese phosphate ((Fe,Mn)Li1-1.6(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	1	14265-44-2
Mn	0 - 1	7439-96-5
Li	1 - 1.6	7439-93-2
Fe	0 - 1	7439-89-6

RN 407640-60-2 HCA

CN Iron lithium manganese phosphate sulfate (Fe1-2Li1-2Mn0-1[(PO4),(SO4)]) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4S	0 - 1	14808-79-8
O4P	0 - 1	14265-44-2
Mn	0 - 1	7439-96-5
Li	1 - 2	7439-93-2
Fe	1 - 2	7439-89-6

RN 407640-61-3 HCA

CN Iron lithium titanium phosphate ((Fe,Ti)Li0.5-2(PO4)1.5) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	1.5	14265-44-2
Ti	0 - 1	7440-32-6
Li	0.5 - 2	7439-93-2
Fe	0 - 1	7439-89-6

IC ICM H01M004-48

ICS C01B025-37; C01B033-20; H01M004-58; H01M004-62; C01B017-96

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST carbon encapsulated redox material **battery** electrode;
cathode battery carbon coated redox material

IT Silanes

- (alkoxy, silicon source; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)
- IT Polyoxyalkylenes, uses
(alkyl ethers, oligomeric, aprotic solvent; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)
- IT Fluoropolymers, uses
Polyesters, uses
Polyethers, uses
(binders; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)
- IT **Battery cathodes**
Battery electrodes
Redox agents
(carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)
- IT Transition metals, uses
(electrodes contg.; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)
- IT 78-93-3, Methyl ethyl ketone, uses 96-48-0, Butyrolactone
96-49-1, Ethylene carbonate 107-21-1D, Ethylene glycol, alkyl ethers 108-32-7, Propylene carbonate 111-46-6D, Diethylene glycol, alkyl ethers 112-27-6D, Triethylene glycol, alkyl ethers 112-60-7D, Tetraethylene glycol, alkyl ethers 463-79-6D, Carbonic acid, C1-4-alkyl esters
(aprotic solvent; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)
- IT 9011-14-7, Poly(methyl methacrylate) 24937-79-9, Poly(vinylidene difluoride) 25014-41-9, Polyacrylonitrile
(binders; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)
- IT 50-99-7, Glucose, reactions 57-48-7, Fructose, reactions
57-50-1, Sucrose, reactions 58-86-6, Xylose, reactions 87-79-6, Sorbose 9002-88-4, Polyethylene 9003-07-0, Polypropylene 9004-34-6, Cellulose, reactions 9004-34-6D, Cellulose, esters 9004-35-7, Cellulose acetate 9005-25-8, Starch, reactions 25212-86-6, Poly(furfuryl alcohol) 43094-71-9, Ethylene-ethylene oxide copolymer
(carbon source; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)
- IT **407640-63-5**, Iron lithium titanium phosphate sulfate
($\text{Fe}_{0.85}\text{Li}_{1.35}\text{Ti}_{0.15}(\text{PO}_4)_0.5(\text{SO}_4)$)
(electrodes contg.; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)

- IT 7439-89-6D, Iron, mixed oxides 7439-96-5D, Manganese, mixed oxides
7440-02-0D, Nickel, mixed oxides 7440-32-6D, Titanium, mixed
oxides 7440-47-3D, Chromium, mixed oxides 7440-48-4D, Cobalt,
mixed oxides 7440-50-8D, Copper, mixed oxides 7440-62-2D,
Vanadium, mixed oxides 13816-45-0, Triphylite 15365-14-7, Iron
lithium phosphate (FeLiPO_4) 213467-46-0, Iron lithium
manganese phosphate ($\text{FeLi}_2\text{Mn}(\text{PO}_4)_2$)
(electrodes contg.; carbon-coated or carbon-crosslinked redox
materials with transition metal-lithium oxide core for use as
battery electrodes)
- IT 90076-65-6
(**electrolyte** contg.; carbon-coated or
carbon-crosslinked redox materials with transition metal-lithium
oxide core for use as **battery electrodes**)
- IT 516-03-0, Ferrous oxalate
(iron source; carbon-coated or carbon-crosslinked redox materials
with transition metal-lithium oxide core for use as
battery electrodes)
- IT 7429-90-5, Aluminum, uses 7440-31-5, Tin, uses 7440-36-0,
Antimony, uses 7440-66-6, Zinc, uses 7782-42-5, Graphite, uses
39302-37-9, Lithium titanate 207803-50-7, Aluminum cobalt lithium
magnesium nickel oxide 258511-24-9, Iron lithium nitride
263898-18-6, Cobalt manganese nitride 407640-62-4
(lithium-based **cathodes** contg.; carbon-coated or
carbon-crosslinked redox materials with transition metal-lithium
oxide core for use as **battery electrodes**)
- IT 638-38-0, Manganese(II) acetate
(manganese source; carbon-coated or carbon-crosslinked redox
materials with transition metal-lithium oxide core for use as
battery electrodes)
- IT 546-89-4, Lithium acetate 553-91-3, Lithium oxalate 554-13-2,
Lithium carbonate 1309-37-1, Ferric oxide, reactions 1310-65-2,
Lithium hydroxide 1313-13-9, Manganese dioxide, reactions
1314-62-1, Vanadium pentoxide, reactions 1317-61-9, Magnetite,
reactions 10045-86-0, Ferric phosphate 10102-24-6, Lithium
silicate (Li_2SiO_3) 10377-48-7, Lithium sulfate 10377-52-3,
Lithium phosphate (Li_3PO_4) 10421-48-4, Ferric nitrate
12057-24-8, Lithium oxide, reactions 12627-14-4 13453-80-0,
Lithium dihydrogen phosphate 63985-45-5, Lithium orthosilicate
407640-52-2, Iron lithium manganese phosphate
($\text{Fe}_{0.1}\text{-LiMn}_{0.9}(\text{PO}_4)$) 407640-53-3, Iron lithium
magnesium phosphate ($\text{Fe}_{0.7}\text{-LiMg}_{0.3}(\text{PO}_4)$) 407640-54-4,
Calcium iron lithium phosphate ($\text{Ca}_{0.3}\text{Fe}_{0.7}\text{-Li}(\text{PO}_4)$)
407640-55-5 407640-56-6, Iron lithium phosphate
silicate ($\text{FeLi}_{1-1.9}(\text{PO}_4)_{0.1-1}(\text{SiO}_4)_{0-0.9}$) 407640-57-7
407640-58-8, Iron lithium manganese phosphate sulfate
($\text{Fe}_{0-1}\text{Li}_{1-1.2}\text{Mn}_{0-0.2}[(\text{PO}_4), (\text{SO}_4)]$) 407640-59-9, Iron
lithium manganese phosphate ((Fe,Mn) $\text{Li}_{1-1.6}(\text{PO}_4)$)
407640-60-2, Iron lithium manganese phosphate sulfate
($\text{Fe}_{1-2}\text{Li}_{1-2}\text{Mn}_{0-1}[(\text{PO}_4), (\text{SO}_4)]$) 407640-61-3, Iron lithium
titanium phosphate ((Fe,Ti) $\text{Li}_{0.5-2}(\text{PO}_4)_{1.5}$)
(metal source; carbon-coated or carbon-crosslinked redox

- materials with transition metal-lithium oxide core for use as **battery** electrodes)
- IT 25322-68-3D, Polyethylene glycol, alkyl ethers
(oligomeric, aprotic solvent; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)
- IT 7664-38-2, Phosphoric acid, reactions 7664-38-2D, Phosphoric acid, esters 7783-28-0, Ammonium hydrogen phosphate 10124-54-6, Manganese phosphate
(phosphorus source; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)
- IT 7631-86-9, Silica, reactions
(silicon source; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)
- IT 7664-93-9, Sulfuric acid, reactions 7783-20-2, Ammonium sulfate, reactions
(sulfur source; carbon-coated or carbon-crosslinked redox materials with transition metal-lithium oxide core for use as **battery** electrodes)

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136:297381 Method for synthesis of carbon-coated redox materials with controlled size. Armand, Michel; Gauhtier, Michel; Magnan, Jean-Francois; Ravet, Nathalie (Hydro-Quebec, Can.). PCT Int. Appl. WO 2002027823 A1 20020404, 83 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (French). CODEN: PIXXD2. APPLICATION: WO 2001-CA1349 20010921. PRIORITY: CA 2000-2320661 20000926.

- AB Carbon-coated redox materials suitable for use as **battery** electrodes and for fabrication of electrochromic materials, consist of compns. of formulas $C-LixM1-y(XO4)_n$ or $LixM1-yM'y(XO4)_n$, in which: $y = 0-0.6$; $x = 0-2$; $n = 1-1.5$; M is a transition metal or a mixt. of first-row transition metals; M' is a fixed-valent metal ion selected from Mg^{2+} , Ca^{2+} , Al^{3+} , or Zn^{2+} ; and X is S, P, and Si. The resulting materials consist of particles coated with a **conductive** carbon layer. The compns. are prep'd. by reacting a balanced mixt. of precursors in the appropriate proportions, including a pyrolysis step for the carbon-producing compd.(s), such that the materials form a powd. compn. with the desired formula, that has an elec. cond. of $>10^{-8}$ S/cm when compacted at 3750 kg/cm².
- IT 213467-46-0P, Iron lithium manganese phosphate
($FeLi_2Mn(PO_4)_2$)
(redox **cathode** contg.; synthesis of carbon-coated redox

materials for use as **battery cathodes** and in
electrochromic devices)

RN 213467-46-0 HCA
CN Iron lithium manganese phosphate ($\text{FeLi}_2\text{Mn}(\text{PO}_4)_2$) (9CI) (CA INDEX
NAME)

Component	Ratio	Component Registry Number
O4P	2	14265-44-2
Mn	1	7439-96-5
Li	2	7439-93-2
Fe	1	7439-89-6

IC ICM H01M004-48
ICS H01M004-58; H01M004-62; C01B025-37; C01B033-20

CC 52-2 (Electrochemical, Radiational, and Thermal Energy
Technology)
Section cross-reference(s): 72

ST carbon encapsulated redox material **battery** electrode;
electrochromic material carbon coated redox particle size;
cathode battery carbon coated redox material

IT Fluoropolymers, uses
(binder; synthesis of carbon-coated redox materials for use as
battery cathodes and in electrochromic devices)

IT **Battery cathodes**
Battery electrodes
Electrochromic materials
Redox agents
(synthesis of carbon-coated redox materials for use as
battery cathodes and in electrochromic devices)

IT 24937-79-9, Poly(vinylidene difluoride)
(binder; synthesis of carbon-coated redox materials for use as
battery cathodes and in electrochromic devices)

IT 9004-35-7, Cellulose acetate 43094-71-9, Ethylene-ethylene oxide
copolymer
(carbon source; synthesis of carbon-coated redox materials for
use as **battery cathodes** and in electrochromic
devices)

IT 7440-44-0, Carbon, uses
(coating, **cathodes** contg.; synthesis of carbon-coated
redox materials for use as **battery cathodes**
and in electrochromic devices)

IT 96-49-1, Ethylene carbonate 616-38-6, Dimethylcarbonate
7791-03-9, Lithium perchlorate 90076-65-6, Methanesulfonamide,
1,1,1-trifluoro-N-[(trifluoromethyl)sulfonyl]-, lithium salt
(**electrolyte** contg.; synthesis of carbon-coated redox
materials for use as **battery cathodes** and in
electrochromic devices)

IT 554-13-2, Lithium carbonate
(reaction of; synthesis of carbon-coated redox materials for use
as **battery cathodes** and in electrochromic

- devices)
- IT 13463-10-0, Ferric phosphate dihydrate
(**redn.** of; synthesis of carbon-coated redox materials
for use as **battery cathodes** and in
electrochromic devices)
- IT 7429-90-5P, Aluminum, uses 7439-95-4P, Magnesium, uses
7440-66-6P, Zinc, uses 7440-70-2P, Calcium, uses 13816-45-0P,
Triphylite 15365-14-7P, Iron lithium phosphate (FeLiPO_4)
213467-46-0P, Iron lithium manganese phosphate
($\text{FeLi}_2\text{Mn}(\text{PO}_4)_2$)
(redox **cathode** contg.; synthesis of carbon-coated redox
materials for use as **battery cathodes** and in
electrochromic devices)
- L54 ANSWER 5 OF 16 HCA COPYRIGHT 2002 ACS
136:265825 Method for the preparation of **cathode** active
material for a **nonaqueous electrolyte**
battery. Hosoya, Mamoru; Takahashi, Kimio; Fukushima,
Yuzuru (Sony Corporation, Japan). Eur. Pat. Appl. EP 1193783 A2
20020403, 20 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR,
GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, RI, RO.
(English). CODEN: EPXXDW APPLICATION: EP 2001-122751 20010921.
PRIORITY: JP 2000-301400 20000929.
- AB A **nonaq. electrolyte cell** is disclosed
having superior electronic **cond.** and superior cell
characteristics. A **cathode** active material used for the
cell is a composite material of a compd. having the formula
 Li_xFePO_4 , where $0 < x \leq 1.0$, and a carbon material, wherein the
sp. surface area as found by the Brunauer Emmet Teller formula is
not less than $10.3 \text{ m}^2/\text{g}$.
- IT **198782-39-7P**, Iron lithium phosphate ($\text{FeLi}_{0-1}(\text{PO}_4)$)
(method for prepn. of **cathode** active material for
nonaq. electrolyte battery)
- RN 198782-39-7 HCA
CN Iron lithium phosphate ($\text{FeLi}_{0-1}(\text{PO}_4)$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	1	14265-44-2
Li	0 - 1	7439-93-2
Fe	1	7439-89-6

- IC ICM H01M004-58
ICS H01M010-40
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST **battery nonaq electrolyte**
cathode lithium iron phosphate
- IT Secondary **batteries**
(lithium; method for prepn. of **cathode** active material
for **nonaq. electrolyte battery**)
- IT **Battery cathodes**

- Surface area
(method for prepn. of **cathode** active material for
nonaq. electrolyte battery)
- IT Carbon black, uses
Carbonaceous materials (technological products)
(method for prepn. of **cathode** active material for
nonaq. electrolyte battery)
- IT Fluoropolymers, uses
(method for prepn. of **cathode** active material for
nonaq. electrolyte battery)
- IT 108-32-7, Propylene carbonate 616-38-6, Dimethyl carbonate
7439-93-2, Lithium, uses 7440-44-0, Carbon, uses 21324-40-3,
Lithium hexafluorophosphate
(method for prepn. of **cathode** active material for
nonaq. electrolyte battery)
- IT 24937-79-9, PvdF
(method for prepn. of **cathode** active material for
nonaq. electrolyte battery)
- IT 15365-14-7P, Iron lithium phosphate FeLiPO_4 198782-39-7P,
Iron lithium phosphate ($\text{FeLiO-1(PO}_4\text{)}$)
(method for prepn. of **cathode** active material for
nonaq. electrolyte battery)
- L54 ANSWER 6 OF 16 HCA COPYRIGHT 2002 ACS
136:203096 Method for preparation of **cathode** active material
for **nonaqueous electrolyte battery**.
Hosoya, Mamoru; Takahashi, Kimio; Fukushima, Yuzuru (Sony
Corporation, Japan). Eur. Pat. Appl. EP 1184920 A2 20020306, 21 pp.
DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI,
LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN:
EPXXDW. APPLICATION: EP 2001-120637 20010830. PRIORITY: JP
2000-261277 20000830.
- AB A **cathode** active material improved in electron
cond. and a **non-aq. electrolyte**
cell employing this **cathode** active material and
which is improved in cell capacity and cyclic characteristics are
disclosed. The **cathode** active material is composed of a
compd. having the general formula Li_xFePO_4 where $0 < x \leq 1.0$,
and a carbon material, with the carbon content per unit wt. being
not less than 3 wt% and with the powder d. being not lower than 2.2
g/cm³.
- IT 198782-39-7P, Iron lithium phosphate ($\text{FeLiO-1(PO}_4\text{)}$)
(method for prepn. of **cathode** active material for
nonaq. electrolyte battery)
- RN 198782-39-7 HCA
CN Iron lithium phosphate ($\text{FeLiO-1(PO}_4\text{)}$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	1	14265-44-2
Li	0 - 1	7439-93-2

Fe		1		7439-89-6
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IC ICM H01M004-58
 ICS H01M004-62; H01M004-04
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST **cathode** active material prepn **nonaq**
electrolyte battery
 IT Secondary **batteries**
 (lithium; method for prepn. of **cathode** active material
 for **nonaq. electrolyte battery**)
 IT **Battery cathodes**
 Sintering
 (method for prepn. of **cathode** active material for
nonaq. electrolyte battery)
 IT Carbonaceous materials (technological products)
 Fluoropolymers, uses
 (method for prepn. of **cathode** active material for
nonaq. electrolyte battery)
 IT Carbon black, uses
 (method for prepn. of **cathode** active material for
nonaq. electrolyte battery)
 IT 10045-86-0, Phosphoric acid, iron(3+) salt (1:1) 10377-52-3,
 Lithium phosphate
 (method for prepn. of **cathode** active material for
nonaq. electrolyte battery)
 IT 96-49-1, Ethylene carbonate 108-32-7, Propylene carbonate
 616-38-6, Dimethyl carbonate 7439-93-2, Lithium, uses
 21324-40-3, Lithium hexafluorophosphate
 (method for prepn. of **cathode** active material for
nonaq. electrolyte battery)
 IT 24937-79-9, PvdF
 (method for prepn. of **cathode** active material for
nonaq. electrolyte battery)
 IT 15365-14-7P, Iron lithium phosphate FeLiPO₄ 198782-39-7P,
 Iron lithium phosphate (FeLiO-1(PO₄))
 (method for prepn. of **cathode** active material for
nonaq. electrolyte battery)
 IT 7440-44-0, Carbon, uses
 (method for prepn. of **cathode** active material for
nonaq. electrolyte battery)

L54 ANSWER 7 OF 16 HCA COPYRIGHT 2002 ACS

135:109740 Preparation of lithium-containing materials for
battery cathodes. Barker, Jeremy; Saidi, M.

Yazid; Swoyer, Jeffrey L. (Valence Technology, Inc., USA). PCT Int.
 Appl. WO 2001053198 A1 20010726, 94 pp. DESIGNATED STATES: W: AE,
 AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU,
 CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL,
 IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,
 MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK,
 SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY,
 KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY,

DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2000-US35438 20001222. ~~PRIORITY: US 2000-484919-20000118~~

AB The invention provides novel lithium-mixed metal materials which, upon electrochem. interaction, release lithium ions, and are capable of reversibly cycling lithium ions. The invention provides a rechargeable lithium **battery** which comprises an electrode formed from the novel lithium-mixed metal materials. Methods for making the novel lithium-mixed metal materials and methods for using such lithium-mixed metal materials in **electrochem. cells** are also provided. The lithium-mixed metal materials comprise lithium and at least one other metal besides lithium. Preferred materials are lithium-mixed metal phosphates which contain lithium and two other metals besides lithium.

IT 204653-30-5P, Lithium vanadium phosphate $\text{Li}_3\text{V}_2(\text{PO}_4)_3$
(prepn. of lithium-contg. materials for **battery cathodes**)

RN 204653-30-5 HCA

CN Lithium vanadium phosphate ($\text{Li}_3\text{V}_2(\text{PO}_4)_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

IC ICM C01B025-37

ICS C01B025-45; H01M004-58

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49

ST lithium mixed metal phosphate **battery cathode**

IT **Reduction**

(carbothermic; prepn. of lithium-contg. materials for **battery cathodes**)

IT Secondary **batteries**

(lithium; prepn. of lithium-contg. materials for **battery cathodes**)

IT **Battery cathodes**

(prepn. of lithium-contg. materials for **battery cathodes**)

IT 12162-92-4P, lithium vanadium oxide LiV_2O_5 204653-30-5P,

Lithium vanadium phosphate $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ 349632-76-4P, Iron lithium

magnesium phosphate ($\text{Fe}_{0.9}\text{LiMg}_{0.1}(\text{PO}_4)$) 349632-79-7P, Calcium iron

lithium phosphate ($\text{Ca}_{0.1}\text{Fe}_{0.9}\text{Li}(\text{PO}_4)$) 349632-82-2P, Iron lithium

zinc phosphate ($\text{Fe}_{0.9}\text{LiZn}_{0.1}(\text{PO}_4)$)

(prepn. of lithium-contg. materials for **battery cathodes**)

IT 546-89-4, Lithium acetate 553-91-3, Lithium oxalate 554-13-2,

Lithium carbonate 1305-62-0, Calcium hydroxide, reactions

1309-37-1, Ferric oxide, reactions 1309-42-8, Magnesium hydroxide

1314-62-1, Vanadium pentoxide, reactions 1317-61-9, iron oxide

fe3o4, reactions 7440-44-0, Carbon, reactions 7722-76-1,
 Ammonium dihydrogen phosphate 7783-28-0, Diammonium hydrogen
 phosphate 7790-69-4, Lithium nitrate 7803-55-6, Ammonium
 vanadate 10045-86-0, iron phosphate fepo4 10377-52-3, Lithium
 phosphate 11126-15-1, Lithium vanadium oxide 12036-21-4,
 Vanadium dioxide 12057-24-8, Lithia, reactions 13453-80-0,
 Lithium dihydrogen phosphate 15060-59-0, lithium vanadium oxide
 livo3

(prepn. of lithium-contg. materials for **battery**
cathodes)

IT 15365-14-7P, iron lithium phosphate FeLiPO4
 (prepn. of lithium-contg. materials for **battery**
cathodes)

L54 ANSWER 8 OF 16 HCA COPYRIGHT 2002 ACS

131:324968 Improvement of discharge capacity of .beta.-Fe2(SO4)3-type
 Li3V2(PO4)3 by stabilizing high temperature orthorhombic phase at
 room temperature. Ohkawa, Hirokazu; Yoshida, Kenji; Saito, Mai;
 Uematsu, Kazuyoshi; Toda, Kenji; Sato, Mineo (Department of
 Chemistry and Chemical Engineering, Faculty of Engineering, Niigata
 University, Niigata, 950-2181, Japan). Chemistry Letters (10),
 1017-1018 (English) 1999. CODEN: CMLTAG. ISSN: 0366-7022.
 Publisher: Chemical Society of Japan.

AB The **cathode** performance of a lithium ion **battery**
 was investigated for .beta.-Fe2(SO4)3-type Li3V2(PO4)3 and
 Li3(V1-xZrx)2(PO4)3 (x=0.05, 0.1, 0.15, 0.2). On TG-DTA
 measurements, Li3V2(PO4)3 exhibited two types of phase transition,
 while Li3(V1-xZrx)2(PO4)3 exhibited no phase transition. Powder
 X-ray diffraction anal. and **cond.** measurements confirmed
 an evidence for the stabilization of the high temp. phase at room
 temp. The discharge capacity of the Zr-substituted
 Li3(V1-xZrx)2(PO4)3 samples became much larger than that of the pure
 Li3V2(PO4)3 sample.

IT 204653-30-5, Lithium vanadium phosphate Li3V2(PO4)3
 (improvement of discharge capacity of .beta.-Fe2(SO4)3-type
 Li3V2(PO4)3 by stabilizing high temp. orthorhombic phase at room
 temp.)

RN 204653-30-5 HCA

CN Lithium vanadium phosphate (Li3V2(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST **battery cathode** lithium vanadium phosphate
 IT **Battery cathodes**
 Ionic **conductivity**
 Structural phase transition

(improvement of discharge capacity of .beta.-Fe₂(SO₄)₃-type Li₃V₂(PO₄)₃ by stabilizing high temp. orthorhombic phase at room temp.)

IT Secondary **batteries**

(lithium; improvement of discharge capacity of .beta.-Fe₂(SO₄)₃-type Li₃V₂(PO₄)₃ by stabilizing high temp. orthorhombic phase at room temp.)

IT 204653-30-5, Lithium vanadium phosphate Li₃V₂(PO₄)₃
 248263-63-0, Lithium vanadium zirconium phosphate
 (Li₃V_{1.9}Zr_{0.1}(PO₄)₃) 248263-64-1, Lithium vanadium zirconium
 phosphate (Li₃V_{1.8}Zr_{0.2}(PO₄)₃) 248263-65-2, Lithium vanadium
 zirconium phosphate (Li₃V_{1.7}Zr_{0.3}(PO₄)₃) 248263-66-3, Lithium
 vanadium zirconium phosphate (Li₃V_{1.6}Zr_{0.4}(PO₄)₃)
 (improvement of discharge capacity of .beta.-Fe₂(SO₄)₃-type
 Li₃V₂(PO₄)₃ by stabilizing high temp. orthorhombic phase at room
 temp.)

L54 ANSWER 9 OF 16 HCA COPYRIGHT 2002 ACS

130:314316 New lithium-ion **conductors** based on the NASICON
 structure. Thangadurai, Venkataraman; Shukla, Ashok K.;
 Gopalakrishnan, Jagannatha (Solid State and Structural Chemistry
 Unit, Indian Institute of Science, Bangalore, 560 012, India).
 Journal of Materials Chemistry, 9(3), 739-741 (English) 1999.
 CODEN: JMACEP. ISSN: 0959-9428. Publisher: Royal Society of
 Chemistry.

AB Lithium-ion **conduction** in mixed-metal phosphates,
 Li₃MVMIII(PO₄)₃ [MV=Nb, Ta; MIII=Al, Cr, Fe], possessing the
 rhombohedral (R3c) NASICON structure has been investigated. Among
 the phosphates investigated, LiTaAl(PO₄)₃ exhibits the highest
cond., .sigma..apprxeq.1.0.times.10⁻² S cm⁻¹ at 350.degree.
 (E_a=0.47 eV), comparable to the **cond.** of LiTi₂(PO₄)₃.
 Unlike LiTi₂(PO₄)₃ which contains lithium-reducible TiIV,
 LiTaAl(PO₄)₃ contains stable TaV and AlIII oxidn. states and hence
 deserves further attention towards tailoring new lithium-ion
conductors for application as **electrolytes** in
 solid state lithium **batteries**.

IT 196612-05-2P, Iron lithium niobium phosphate FeLiNb(PO₄)₃
 223618-03-9P, Aluminum lithium tantalum phosphate
 (AlLiTa(PO₄)₃) 223618-07-3P, Aluminum lithium tantalum
 phosphate (Al_{1.1}Li_{1.2}Ta_{0.9}(PO₄)₃)
 (lithium-ion **conductors** based on NASICON structure)

RN 196612-05-2 HCA

CN Iron lithium niobium phosphate (FeLiNb(PO₄)₃) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	3	14265-44-2
Nb	1	7440-03-1
Li	1	7439-93-2
Fe	1	7439-89-6

RN 223618-03-9 HCA

CN Aluminum lithium tantalum phosphate (AlLiTa(PO₄)₃) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	3	14265-44-2
Ta	1	7440-25-7
Li	1	7439-93-2
Al	1	7429-90-5

RN 223618-07-3 HCA

CN Aluminum lithium tantalum phosphate (Al_{1.1}Li_{1.2}Ta_{0.9}(PO₄)₃) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	3	14265-44-2
Ta	0.9	7440-25-7
Li	1.2	7439-93-2
Al	1.1	7429-90-5

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **battery** lithium ion **conductor** Nasicon structureIT **Battery electrolytes**Ionic **conductivity**

NASICONs

(lithium-ion **conductors** based on NASICON structure)

IT 19527-80-1P, Lithium zirconium phosphate LiZr₂(PO₄)₃ 30622-39-0P,
 Lithium titanium phosphate LiTi₂(PO₄)₃ 161774-34-1P, Iron lithium
 tantalum phosphate (FeLiTa(PO₄)₃) 196612-05-2P, Iron
 lithium niobium phosphate FeLiNb(PO₄)₃ 223618-03-9P,
 Aluminum lithium tantalum phosphate (AlLiTa(PO₄)₃)
 223618-07-3P, Aluminum lithium tantalum phosphate
 (Al_{1.1}Li_{1.2}Ta_{0.9}(PO₄)₃)
 (lithium-ion **conductors** based on NASICON structure)

L54 ANSWER 10 OF 16 HCA COPYRIGHT 2002 ACS

129:97673 Characteristics of 3D framework **cathodes** with
 (XO₄)_n- polyanions. Okada, S.; Arai, H.; Asakura, K.; Sakurai, Y.;
 Yamaki, J.; Nanjundaswamy, K. S.; Padhi, A. K.; Masquelier, C.;
 Goodenough, J. B. (NTT Integrated Information and Energy Systems
 Laboratories, Ibaraki, 319-11, Japan). Progress in Batteries &
 Battery Materials, 16, 302-308 (English) 1997. CODEN: PBBMEF.
 ISSN: 1099-4467. Publisher: ITE-JEC Press Inc..

AB In an effort to identify alternate NASICON related framework hosts
 for Li intercalation, we have investigated the synthesis and
 electrochem. characterization of 3 inexpensive, environmentally
 benign phosphates contg. Fe and V, viz. Li₃Fe₂(PO₄)₃, Li₃V₂(PO₄)₃,

and $\text{Li}_3\text{FeV}(\text{PO}_4)_3$. The compds. are synthesized by a one-step solid state reaction. The redox voltages $\text{V}^{4+}/\text{V}^{3+}$ and $\text{Fe}^{3+}/\text{Fe}^{2+}$ in these compds. are tech. attractive for Li rechargeable **battery** applications. Moreover, the octahedral-site redox couples $\text{V}^{4+}/\text{V}^{3+}$ and $\text{V}^{3+}/\text{V}^{2+}$ are sepd. by 2.0 V, and both the $\text{Fe}^{3+}/\text{Fe}^{2+}$ and $\text{V}^{3+}/\text{V}^{2+}$ redox voltages get **reduced** by 0.8 V on going from the sulfate to the phosphate polyanion.

IT 204653-30-5, Lithium vanadium phosphate $\text{Li}_3\text{V}_2(\text{PO}_4)_3$
 (characteristics of 3D framework **cathodes** with $(\text{XO}_4)^n$ -
 polyanions)
 RN 204653-30-5 HCA
 CN Lithium vanadium phosphate ($\text{Li}_3\text{V}_2(\text{PO}_4)_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST **battery cathode** phosphate polyanion
 IT **Battery cathodes**

(characteristics of 3D framework **cathodes** with $(\text{XO}_4)^n$ -
 polyanions)
 IT 36058-25-0, Iron lithium phosphate $\text{Fe}_2\text{Li}_3(\text{PO}_4)_3$ 186131-68-0, Iron
 lithium vanadiumphosphate $\text{FeLi}_3\text{V}(\text{PO}_4)_3$ 204653-30-5,
 Lithium vanadium phosphate $\text{Li}_3\text{V}_2(\text{PO}_4)_3$
 (characteristics of 3D framework **cathodes** with $(\text{XO}_4)^n$ -
 polyanions)

L54 ANSWER 11 OF 16 HCA COPYRIGHT 2002 ACS

129:20826 New **cathode** materials for rechargeable lithium
batteries: the 3-D framework structures $\text{Li}_3\text{Fe}_2(\text{XO}_4)_3$ ($\text{X} = \text{P},$
 As). Masquelier, C.; Padhi, A. K.; Nanjundaswamy, K. S.;
 Goodenough, J. B. (Center for Materials Science and Engineering,
 University of Texas at Austin, Austin, TX, 78712-1063, USA).
 Journal of Solid State Chemistry, 135(2), 228-234 (English) 1998.
 CODEN: JSSCBI. ISSN: 0022-4596. Publisher: Academic Press.

AB Electrochem. insertion of lithium into four $\text{Li}_3\text{Fe}_2(\text{XO}_4)_3$ polymorphs
 ($\text{X} = \text{P}$ or As) with 3-D framework structures was carried out in
 "Li/ LiClO_4 (PC:DME)/**cathode**" coin cells. Approx. 2 Li per
 formula unit could be reversibly inserted into the three different
 structures, which corresponds to the **redn.** of all Fe^{3+} to
 Fe^{2+} between 2.5 and 3.5 V vs lithium. The position of the
 $\text{Fe}^{3+}/\text{Fe}^{2+}$ redox couple below the lithium-anode Fermi energy is
 nearly independent of the structure and of whether $\text{X} = \text{P}$ or As .
 There is, however, a clear dependence of (i) the shape of the V_{cc} vs
 x curves for $\text{Li}_{3+x}\text{Fe}_2(\text{XO}_4)_3$ and (ii) the charge-discharge rate
 capabilities on the crystal structure of the **cathode**
 material.

IT 198782-41-1, Iron lithium phosphate ($\text{Fe}_2\text{Li}_3\text{-5}(\text{PO}_4)_3$)

(new **cathode** materials for rechargeable lithium
batteries: 3-D framework structures $\text{Li}_3\text{Fe}_2(\text{XO}_4)_3$ (X = P,
 As))
 RN 198782-41-1 HCA
 CN Iron lithium phosphate ($\text{Fe}_2\text{Li}_3\text{-5}(\text{PO}_4)_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	3	14265-44-2
Li	3 - 5	7439-93-2
Fe	2	7439-89-6

CC 72-2 (Electrochemistry)
 Section cross-reference(s): 52, 56
 ST rechargeable lithium **battery cathode** electrochem
 insertion; ionic **conductor** iron phosphate arsenate
 structure
 IT Electric charge
 (electrochem. charge-discharge curves for the first cycle of
 lithium iron phosphate/arsenate **cathodes**)
 IT Current density
 (in comparison of capacities for polymorphs $\text{Li}_3\text{Fe}_2(\text{PO}_4)_3$
cathode materials for rechargeable lithium
batteries)
 IT Carbon black, uses
 (in formation of $\text{Li}_3\text{Fe}_2(\text{XO}_4)_3$ (X = P, As) **cathode** for
 rechargeable lithium **batteries**)
 IT Fluoropolymers, uses
 (in formation of $\text{Li}_3\text{Fe}_2(\text{XO}_4)_3$ (X = P, As) **cathode** for
 rechargeable lithium **batteries**)
 IT **Battery cathodes**
 Secondary **batteries**
 (new **cathode** materials for rechargeable lithium
batteries: 3-D framework structures $\text{Li}_3\text{Fe}_2(\text{XO}_4)_3$ (X = P,
 As))
 IT Oxidation, electrochemical
 (of Fe^{2+} in lithium iron phosphate and arsenate **cathodes**
)
 IT **Reduction**, electrochemical
 (of Fe^{3+} in lithium iron phosphate and arsenate **cathodes**
)
 IT 16986-74-6
 (as **cathode** materials for rechargeable lithium
batteries)
 IT 16570-18-6
 (**cathode** materials for rechargeable lithium
batteries)
 IT 207733-44-6, Iron lithium phosphate ($\text{Fe}_2\text{Li}_5(\text{PO}_4)_3$)
 (electrochem. formation: new **cathode** materials for
 rechargeable lithium **batteries**)
 IT 207733-39-9, Iron lithium phosphate ($\text{Fe}_2\text{Li}_4(\text{PO}_4)_3$)

- (electrochem. formation: new **cathode** materials for rechargeable lithium **batteries**)
- IT 9002-84-0, PTFE
(in formation of $\text{Li}_3\text{Fe}_2(\text{XO}_4)_3$ ($\text{X} = \text{P}, \text{As}$) **cathode** for rechargeable lithium **batteries**)
- IT 36058-25-0P 101324-14-5P
(monoclinic and rhombohedral; as new **cathode** materials for rechargeable lithium **batteries**; lithium electrochem., intercalation/deintercalation by)
- IT 198782-41-1, Iron lithium phosphate ($\text{Fe}_2\text{Li}_3-5(\text{PO}_4)_3$)
(new **cathode** materials for rechargeable lithium **batteries**: 3-D framework structures $\text{Li}_3\text{Fe}_2(\text{XO}_4)_3$ ($\text{X} = \text{P}, \text{As}$))
- IT 207733-37-7, Iron lithium arsenate ($\text{Fe}_2\text{Li}_3-4.8(\text{AsO}_4)_3$)
(new **cathode** materials for rechargeable lithium **batteries**: electrochem. formation of)
- L54 ANSWER 12 OF 16 HCA COPYRIGHT 2002 ACS
- 128:117313 Molded electrodes for lithium **batteries**. Takata, Kazunori; Iwamoto, Kazuya; Kondo, Shigeo; Takeuchi, Yasumasa; Masaka, Fusazumi; Ishikawa, Katsuhiro (Matsushita Electric Industrial Co., Ltd., Japan; Japan Synthetic Rubber Co., Ltd.). Jpn. Kokai Tokkyo Koho JP 10003926 A2 19980106 Heisei, 13 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1996-154621 19960614.
- AB The electrodes contain polymers, which have SO_3 or SO_3 -electron donor adduct attached to C:C double bonds in the polymer mol. and can be electrochem. oxidized and **reduced** in a Li^+ **conductive electrolyte**.
- IT 120479-61-0, Aluminum lithium titanium phosphate [$\text{Al}_{0.3}\text{Li}_{1.3}\text{Ti}_{1.7}(\text{PO}_4)_3$]
(binders from polymers contg. sulfur trioxide or sulfur trioxide-electron donor adduct on double bonds for secondary lithium **battery** electrodes)
- RN 120479-61-0 HCA
- CN Aluminum lithium titanium phosphate ($\text{Al}_{0.3}\text{Li}_{1.3}\text{Ti}_{1.7}(\text{PO}_4)_3$) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	3	14265-44-2
Ti	1.7	7440-32-6
Li	1.3	7439-93-2
Al	0.3	7429-90-5

- IC ICM H01M004-62
ICS H01M010-40
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST lithium **battery** electrode sulfur trioxide polymer;
battery electrode sulfur trioxide contg polymer
- IT **Battery** electrodes

- (binders from polymers contg. sulfur trioxide or sulfur trioxide-electron donor adduct on double bonds for secondary lithium **battery** electrodes)
- IT EPDM rubber
(reaction products with sulfur trioxide-dioxane adducts; binders from polymers contg. sulfur trioxide or sulfur trioxide-electron donor adduct on double bonds for secondary lithium **battery** electrodes)
- IT 123-91-1D, Dioxane, sulfur trioxide adducts, reaction products with double bond contg. polymers 7446-11-9D, Sulfur trioxide, reaction products with double bond contg. polymers, uses 7782-42-5, Graphite, uses 9003-55-8D, Butadiene-styrene copolymer, reaction products with sulfur trioxide-dioxane adducts 11113-63-6, Graphite fluoride 12031-65-1, Lithium nickel oxide (LiNiO₂) 12057-17-9, Lithium manganese oxide (LiMn₂O₄) 12190-79-3, Cobalt lithium oxide (CoLiO₂) 25034-71-3D, Dicyclopentadiene-ethylene-propylene copolymer, reaction products with sulfur trioxide-dioxane adducts 25038-32-8D, Isoprene-styrene copolymer, reaction products with sulfur trioxide-dioxane adducts **120479-61-0**, Aluminum lithium titanium phosphate [Al_{0.3}Li_{1.3}Ti_{1.7}(PO₄)₃]
(binders from polymers contg. sulfur trioxide or sulfur trioxide-electron donor adduct on double bonds for secondary lithium **battery** electrodes)
- IT 201471-17-2, Lithium phosphate sulfide thiosilicate (Li_{1.29}(PO₄)_{0.01}S_{0.27}(SiS₃)_{0.36}) 201471-18-3, Lithium oxide sulfide thiosilicate (Li_{1.24}O_{0.05}S_{0.19}(SiS₃)_{0.38})
(solid **electrolytes** in secondary lithium **battery** electrodes)
- IT 105729-79-1D, Isoprene-styrene block copolymer, reaction products with sulfur trioxide-dioxane adducts
(triblock; binders from polymers contg. sulfur trioxide or sulfur trioxide-electron donor adduct on double bonds for secondary lithium **battery** electrodes)
- L54 ANSWER 13 OF 16 HCA COPYRIGHT 2002 ACS
117:61381 Lithium insertion in vanadyl phosphate. Pozas, R.; Madueno, S.; Bruque, S.; Moreno-Real, L.; Martinez-Lara, M.; Criado, C.; Ramos-Barrado, J. (Dep. Quim. Inorg., Univ. Malaga, Malaga, 29071, Spain). Solid State Ionics, 51(1-2), 79-83 (English) 1992. CODEN: SSIOD3. ISSN: 0167-2738.
- AB The reaction between LiNO₃ and VOPO₄·2H₂O in Me₂CO medium takes place, besides a redox process, by an acid-basic reaction. The material obtained, Li_{1.6}VOPO₄·H₂O, is a **non**-homogeneous solid, which is converted to a cryst. solid if annealed at 450.degree.. The existence of Li⁺ within the intracryst. spaces of Li intercalate as well as the partial **redn.** of V(V) to V(IV) leads to a mixed ionic-electronic **conductor**. This fact is confirmed by the impedance spectroscopy study. Li_{1.6}VOPO₄·H₂O was characterized by x-ray powder diffractometry, spectroscopy (IR, UV/visible/near-IR diffuse reflectance), and elec. **cond.**
- IT **142445-14-5P**

(prepn. and ionic-electronic cond. of intercalation
compd.)

RN 142445-14-5 HCA

CN Lithium vanadium oxide phosphate (Li_{1.6}VO(PO₄)), monohydrate (9CI)
(CA INDEX NAME)

CM 1

CRN 142445-13-4

CMF Li . O4 P . O . V

CCI TIS

CM 2

CRN 17778-80-2

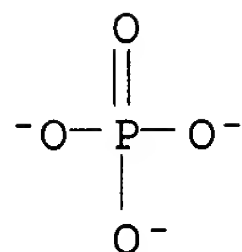
CMF O

O

CM 3

CRN 14265-44-2

CMF O4 P



CM 4

CRN 7440-62-2

CMF V

V

CM 5

CRN 7439-93-2

CMF Li

Li

CC 78-3 (Inorganic Chemicals and Reactions)

Section cross-reference(s): 76

ST ionic electronic **conductor** lithium vanadyl phosphate

IT Electric **conductivity** and **conduction**
(electronic-ionic, of lithium vanadium(IV/V) oxide phosphate)

IT **142445-14-5P**
(prepn. and ionic-electronic **cond.** of intercalation
compd.)

L54 ANSWER 14 OF 16 HCA COPYRIGHT 2002 ACS

117:48781 Lewis acid-promoted decarbonylation of coordinated carbon dioxide: reactions of (.eta.5-MeC5H4)2Nb(.eta.2-CO2)CH2SiMe3 with Lewis acids. Fu, Peng Fei; Khan, Masood A.; Nicholas, Kenneth M. (Dep. Chem. Biochem., Univ. Oklahoma, Norman, OK, 73019, USA). Organometallics, 11(7), 2607-13 (English) 1992. CODEN: ORGND7. ISSN: 0276-7333.

AB The interaction of Cp'2Nb(.eta.2-CO2)CH2SiMe3 (1; Cp' = .eta.5-MeC5H4) with several Lewis acids has been studied and found to result in facile decarbonylation of 1; the Nb-contg. products depend markedly on the Lewis acid partner. Reaction of 1 with LiPF6 or BF3.Et2O causes both decarbonylation and **deoxygenation**, producing [Cp'2Nb(F)CH2SiMe3]Z [Z = PF6- (3), BF4-], which have been characterized spectroscopically and (for 3) by x-ray diffraction; 3 is also produced in the reaction of the oxo deriv. Cp'2Nb(O)CH2SiMe3 (2) with LiPF6 or BF3.Et2O. 1 Reacts with ZnCl2 first to form an adduct, Cp'2Nb(CO2)CH2SiMe3.ZnCl2 (7), which based on IR and NMR data appears to have a novel .mu.-CO2 unit bridging Nb and Zn. Complex 7 is unstable, decomp. with CO loss to form [Cp'2Nb(CH2SiMe3)O.ZnCl2]2 (8), an adduct of ZnCl2 with the oxo species 2, which has been characterized crystallog.; 8 is also produced from 2 and ZnCl2. Reaction of 1 with HgCl2 rapidly produces an incompletely characterized product, which has been both decarbonylated and dealkylated. Although CdCl2 does not react with 1 under comparable conditions, Me3SiCl reacts rapidly with 1 to produce Cp'2Nb(O)Cl (11), resulting from decarbonylation and dealkylation; the structure of 11 has been established by x-ray diffraction.

IT **142066-82-8P**
(prepn., IR spectrum, and decompn. of)

RN 142066-82-8 HCA

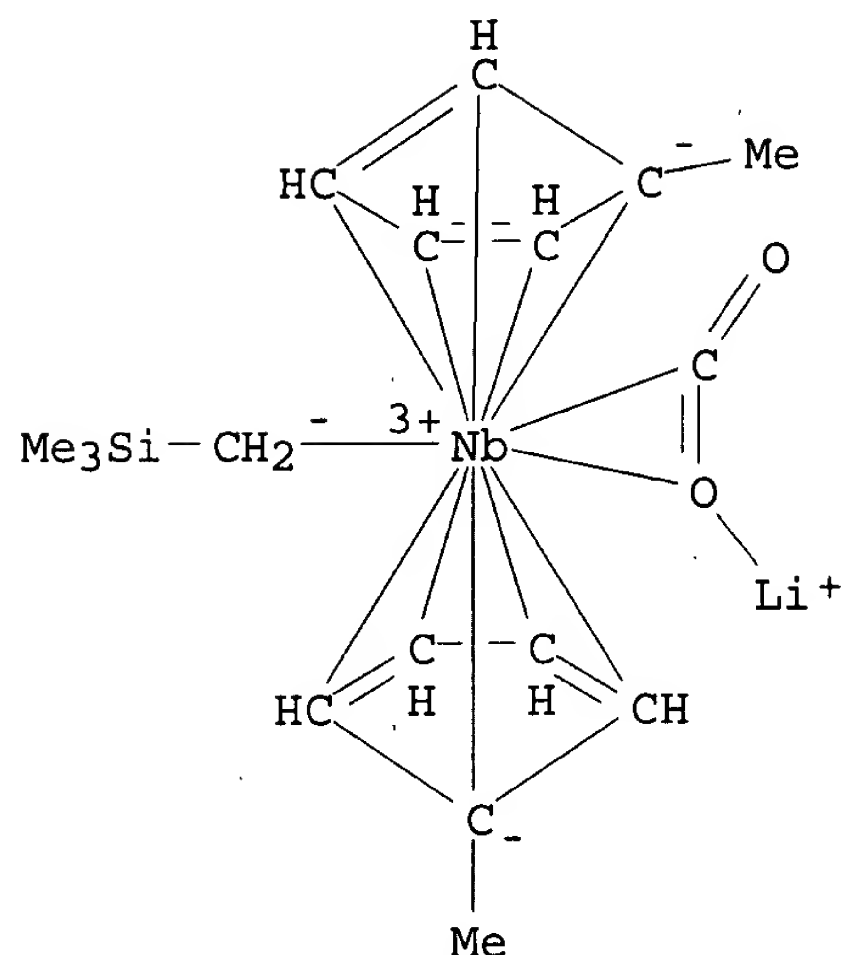
CN Lithium(1+), [bis[(1,2,3,4,5-.eta.)-1-methyl-2,4-cyclopentadien-1-yl][(trimethylsilyl)methyl]niobium][.mu.-[(C,O-.eta.)-carbon dioxide-O']]-, hexafluorophosphate(1-) (9CI) (CA INDEX NAME)

CM 1

CRN 142066-81-7

CMF C17 H25 Li Nb O2 Si

CCI CCS

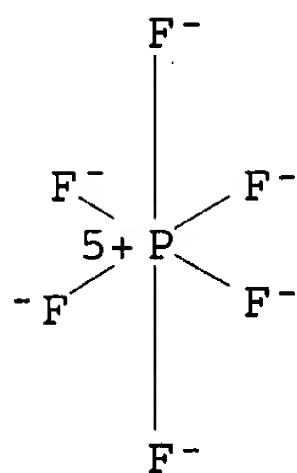


CM 2

CRN 16919-18-9

CMF F6 P

CCI CCS



CC 29-10 (Organometallic and Organometalloidal Compounds)
Section cross-reference(s): 75

IT 142066-82-8P
(prepn., IR spectrum, and decompn. of)

L54 ANSWER 15 OF 16 HCA COPYRIGHT 2002 ACS

115:265266 Intercalation in 3D-skeleton structures: ionic and electronic features. Hagenmuller, Paul; Delmas, Claude (Lab. Chimie Solide, Univ. Bordeaux I, Talence, 33405, Fr.). Materials Research Society Symposium Proceedings, 210(Solid State Ionics 2), 323-34 (English) 1991. CODEN: MRSPDH. ISSN: 0272-9172.

AB The voltage of an **electrochem. cell**, i.e. the difference between the chem. potentials of the two electrodes, may play the role of a sensor which allows to display the structural modifications and the phys. properties. The electrochem. processes involved in an alkali metal (A) intercalation electrode emphasize the influence of the ionic and/or electronic features. The A+-lattice and A+-A+ interactions as well as electronic band-filling may lead to phase transitions or even limit the intercalation reaction. The shape of the cell voltage vs. intercalation rate curve depends on the no. of vacant sites available for intercalation, the no. and the oxidn. state of the **reducible** cations, the band structure of the material and the covalency of the framework. Alkali ion intercalation in 3D-structures related to perovskite ($\text{Ln}_{1/3}\text{NbO}_3$), hexagonal tungsten bronze ($\text{LiW}_3\text{O}_9\text{F}$) and Nasicon-type ($\text{AM}_2(\text{PO}_4)_3$) is discussed from that point of view. In $\text{Ln}_{1/3}\text{NbO}_3$ ($\text{Ln} = \text{La}, \text{Nd}$) (i.e. $\cdot\text{box. } 1/2\text{Ln}_{1/3}\cdot\text{box. } 1/6\text{NbO}_3$) Li^+ intercalation in various sites is related to the rare earth size. Two extra lithium atoms can be introduced into $\text{LiW}_3\text{O}_9\text{F}$ in which four sites are available, but only one out of two is occupied in order to **reduce** the electrostatic interactions. Moreover the change in the discharge curves can be assocd. to the modifications with intercalation rate of the Li^+ -lattice interactions. Within the Nasicon derived structures of $\text{ATi}_2(\text{PO}_4)_3$ and $\text{Fe}_2(\text{MoO}_4)_3$ the intercalation process is limited by the lowest stable oxidn. state of titanium or iron. In both systems the strong electronic localization leads to formation of large two phase-domains. The relevance of using 3D-intercalation electrodes in electrochem. power **batteries** will be discussed as for factors such as elec. behavior or absence of significant unit cell modifications of the **pos. electrodes** during the intercalation process are essential for many cycle utilizations.

IT 119536-20-8, Lithium titanium phosphate ($\text{Li}_{1-3}\text{Ti}_2(\text{PO}_4)_3$)
(charging and discharging of, intercalation in relation to)
RN 119536-20-8 HCA
CN Lithium titanium phosphate ($\text{Li}_{1-3}\text{Ti}_2(\text{PO}_4)_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	3	14265-44-2
Ti	2	7440-32-6
Li	1 - 3	7439-93-2

CC 72-2 (Electrochemistry)
Section cross-reference(s): 78
IT 119536-20-8, Lithium titanium phosphate ($\text{Li}_{1-3}\text{Ti}_2(\text{PO}_4)_3$)
119536-21-9, Sodium titanium phosphate ($\text{Na}_{1-3}\text{Ti}_2(\text{PO}_4)_3$)
(charging and discharging of, intercalation in relation to)

L54 ANSWER 16 OF 16 HCA COPYRIGHT 2002 ACS
110:123586 The NASICON-type titanium phosphates $\text{ATi}_2(\text{PO}_4)_3$ (A = lithium, sodium) as electrode materials. Delmas, C.; Nadiri, A.; Soubeyroux,

J. L. (Lab. Chim. Solide, Univ. Bordeaux I, Talence, 33405, Fr.).
Solid State Ionics, Volume Date 1987, 28-30 (Pt. 1), 419-23 (English)
1988. CODEN: SSIOD3. ISSN: 0167-2738.

- AB Li and Na were intercalated in $\text{LiTi}_2(\text{PO}_4)_3$ and $\text{NaTi}_2(\text{PO}_4)_3$, resp..
Despite the low electronic **cond.** of the Nasicon framework
the intercalation can be realized either chem. or electrochem. The
electrochem. study shows the reversibility of the process and the
existence of large biphased domains in both systems. The obsd.
phase sepn. reactions result from $\text{Li}^+(\text{Na}^+)$ and e^- migration without
skeleton bond breaking and recombination. The large hexagonal
c-parameter of $\text{Li}_3\text{Ti}_2(\text{PO}_4)_3$ results from a peculiar Li ion
distribution (M(1) empty, M(2) fully occupied) as shown by neutron
diffraction.
- IT 119536-20-8P, Lithium titanium phosphate ($\text{Li}_{1-3}\text{Ti}_2(\text{PO}_4)_3$)
119536-22-0P, Lithium titanium phosphate ($\text{Li}_{2.72}\text{Ti}_2(\text{PO}_4)_3$)
119536-23-1P, Lithium titanium phosphate ($\text{Li}_{1-3.3}\text{Ti}_2(\text{PO}_4)_3$)
(formation of, electrochem.)

RN 119536-20-8 HCA

CN Lithium titanium phosphate ($\text{Li}_{1-3}\text{Ti}_2(\text{PO}_4)_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	3	14265-44-2
Ti	2	7440-32-6
Li	1 - 3	7439-93-2

RN 119536-22-0 HCA

CN Lithium titanium phosphate ($\text{Li}_{2.72}\text{Ti}_2(\text{PO}_4)_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	3	14265-44-2
Ti	2	7440-32-6
Li	2.72	7439-93-2

RN 119536-23-1 HCA

CN Lithium titanium phosphate ($\text{Li}_{1-3.3}\text{Ti}_2(\text{PO}_4)_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	3	14265-44-2
Ti	2	7440-32-6
Li	1 - 3.3	7439-93-2

CC 72-2 (Electrochemistry)

Section cross-reference(s): 76, 78

- IT 119536-20-8P, Lithium titanium phosphate ($\text{Li}_{1-3}\text{Ti}_2(\text{PO}_4)_3$)
119536-21-9P, Sodium titanium phosphate ($\text{Na}_{1-3}\text{Ti}_2(\text{PO}_4)_3$)
119536-22-0P, Lithium titanium phosphate ($\text{Li}_{2.72}\text{Ti}_2(\text{PO}_4)_3$)

- 119536-23-1P, Lithium titanium phosphate ($\text{Li}_{1-3.3}\text{Ti}_2(\text{PO}_4)_3$)
(formation of, electrochem.)
- IT 109-72-8, Butyl lithium, reactions
(redn. by, of lithium titanium phosphate, lithium
intercalation in relation to)
- IT 3481-12-7, Naphthalene radical ion(1-) sodium
(redn. by, of sodium titanium phosphate, sodium
intercalation in relation to)
- => d 155 1-19 cbib abs hitstr hitind
- L55 ANSWER 1 OF 19 HCA COPYRIGHT 2002 ACS
137:235112 A reversible lithium intercalation process in an ReO_3 -type
structure $\text{PNb}_9\text{O}_{25}$. Patoux, Sebastien; Dolle, Mickael; Rousse,
Gwenaelle; Masquelier, Christian (Laboratoire de Reactivite et de
Chimie des Solides, CNRS UMR 6007, Universite de Picardie Jules
Verne, Amiens, 80039, Fr.). Journal of the Electrochemical Society,
149(4), A391-A400 (English) 2002. CODEN: JESOAN. ISSN: 0013-4651.
Publisher: Electrochemical Society.
- AB Among the large family of Wadsley-Roth-type phases, $\text{PNb}_9\text{O}_{25}$
presents, as other shear structures such as $\text{H-Nb}_2\text{O}_5$, $\text{GeNb}_{18}\text{O}_{47}$, and
 $\text{VNb}_9\text{O}_{25}$, a peculiar arrangement of 3 .times. 3 .times. .infin.
 ReO_3 -type blocks connected through XO_4 tetrahedra. The crystal
structure was redetd. by combined Rietveld refinements of X-ray and
neutron powder diffraction data, for the first time in the
tetragonal space group $I4$ with $a = 15.615(1)$.ANG. and $c = 3.829(1)$
.ANG.. The electrochem. insertion of lithium into $\text{Li}_x\text{PNb}_9\text{O}_{25}$
reaches a value of $x = 13.5$, between 3.0 and 1.0 V vs. Li^+/Li at a
slow cycling rate. Within this voltage window, in situ X-ray
diffraction reveals that the reversible intercalation of lithium
occurs through three single- and two two-phase regions. The
variation of the lattice parameters as a function of x indicates a
global change of $\Delta V/V = +10\%$ assocd. with the redn.
of Nb^{5+} to Nb^{4+} and then partly to Nb^{3+} . At voltages lower than 1 V
vs. Li^+/Li , extra irreversible phenomena, such as
electrolyte and/or carbon redn. were identified
but, remarkably, highly cryst. particles of $\text{Li}_x\text{PNb}_9\text{O}_{25}$ remain
unaltered when discharging the cell for prolonged time down to 0.02
V vs. Li^+/Li . The behavior of $\text{Li}_x\text{PNb}_9\text{O}_{25}$ is very similar to that of
 $\text{H-Li}_x\text{Nb}_2\text{O}_5$ ($\text{Li}_x\text{NbNb}_9\text{O}_{25}$) but different to that of $\text{Li}_x\text{VNb}_9\text{O}_{25}$ where
irreversible redn. of V^{5+} to V^{2+} (in tetrahedral
coordination) takes place.
- IT 459412-77-2, Lithium niobium oxide phosphate
($\text{Li}_{8.8}\text{Nb}_5\text{O}_{21}(\text{PO}_4)$) 459412-78-3, Lithium niobium oxide
phosphate ($\text{Li}_{6.3}\text{Nb}_9\text{O}_{21}(\text{PO}_4)$)
(formation and properties of; reversible lithium intercalation
process in an ReO_3 -type structure $\text{PNb}_9\text{O}_{25}$ in secondary
batteries)
- RN 459412-77-2 HCA
CN Lithium niobium oxide phosphate ($\text{Li}_{8.8}\text{Nb}_5\text{O}_{21}(\text{PO}_4)$) (9CI) (CA INDEX
NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O	21	17778-80-2
O4P	1	14265-44-2
Nb	5	7440-03-1
Li	8.8	7439-93-2

RN 459412-78-3 HCA

CN Lithium niobium oxide phosphate (Li_{6.3}Nb₉O₂₁(PO₄)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O	21	17778-80-2
O4P	1	14265-44-2
Nb	9	7440-03-1
Li	6.3	7439-93-2

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 75

ST **battery** electrode lithium intercalation rhenium oxide structure; electrochem cycling rhenium oxide lithium **battery** electrode; charging cycling rhenium oxide lithium **battery** electrode

IT Secondary **batteries**

(electrochem. charge-discharge cycling in; reversible lithium intercalation process in an ReO₃-type structure PNb₉O₂₅ in secondary **batteries**)

IT Intercalation

(electrochem.; reversible lithium intercalation process in an ReO₃-type structure PNb₉O₂₅ in secondary **batteries**)

IT **Reduction**, electrochemical

(of PNb₉O₂₅-type phases; reversible lithium intercalation process in an ReO₃-type structure PNb₉O₂₅ in secondary **batteries**)

IT Crystal structure

(of lithium-intercalated PNb₉O₂₅-type phases; reversible lithium intercalation process in an ReO₃-type structure PNb₉O₂₅ in secondary **batteries**)

IT **Battery** electrodes

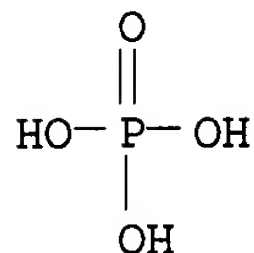
(reversible lithium intercalation process in an ReO₃-type structure PNb₉O₂₅ in secondary **batteries**)

IT 12035-14-2, Niobium oxide phosphate (Nb₉O₂₁(PO₄))

(**battery** electrodes; reversible lithium intercalation process in an ReO₃-type structure PNb₉O₂₅ in secondary **batteries**)

IT 7439-93-2, Lithium, processes 17341-24-1, Lithium(1+), processes (electrochem. incorporation of; reversible lithium intercalation

- process in an ReO₃-type structure PNb9O₂₅ in secondary **batteries**)
- IT 12035-15-3, Niobium vanadium oxide (Nb₉VO₂₅) 12065-02-0, Germanium niobium oxide (GeNb₁₈O₄₇) 407630-24-4, Niobium hydroxide oxide (Nb₂(OH)₄) (electrochem. insertion of Li⁺ in; reversible lithium intercalation process in an ReO₃-type structure PNb9O₂₅ in secondary **batteries**)
- IT 22537-41-3, Niobium(5+), processes (electrochem. **redn.** of; reversible lithium intercalation process in an ReO₃-type structure PNb9O₂₅ in secondary **batteries**)
- IT 15473-95-7, processes 22541-83-9, Niobium(3+), processes (formation and electrochem. **redn.** of; reversible lithium intercalation process in an ReO₃-type structure PNb9O₂₅ in secondary **batteries**)
- IT 459412-77-2, Lithium niobium oxide phosphate (Li_{8.8}Nb₅O₂₁(PO₄)) 459412-78-3, Lithium niobium oxide phosphate (Li_{6.3}Nb₉O₂₁(PO₄)) (formation and properties of; reversible lithium intercalation process in an ReO₃-type structure PNb9O₂₅ in secondary **batteries**)
- L55 ANSWER 2 OF 19 HCA COPYRIGHT 2002 ACS
136:404204 A novel concept for the synthesis of an improved LiFePO₄ lithium **battery cathode**. Croce, F.; D'Epifanio, A.; Hassoun, J.; Deptula, A.; Olczac, T.; Scrosati, B. (Dipartimento di Chimica, Universita "La Sapienza", Rome, 00185, Italy). *Electrochemical and Solid-State Letters*, 5(3), A47-A50 (English) 2002. CODEN: ESLEF6. ISSN: 1099-0062. Publisher: Electrochemical Society.
- AB This paper describes the synthesis and the properties of a kinetically improved LiFePO₄ **cathode** material. The novel aspect of the synthesis is based on a crit. step involving the dispersion of metal (e.g., copper or silver) at a very low concn. (1 wt%). This metal addn. does not affect the structure of the **cathode** but considerably improves its kinetics in terms of capacity delivery and cycle life. Such an enhancement of the electrochem. properties has been ascribed to a **redn.** of the particle size and to an increase of the bulk intra- and interparticle electronic **cond.** of LiFePO₄, both effects being promoted by the finely dispersed metal powders. This improved **cond.** favors the response of LiFePO₄, thus substantiating its interest as new **cathode** for advanced lithium ion **batteries**.
- IT 15365-14-7P, Iron lithium phosphate FeLiPO₄ (novel concept for synthesis of improved LiFePO₄ lithium **battery cathode**)
- RN 15365-14-7 HCA
CN Phosphoric acid, iron(2+) lithium salt (1:1:1) (9CI) (CA INDEX NAME)



● Fe(II)

● Li

- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49, 72
- ST synthesis lithium iron phosphate **battery cathode**
copper silver powder
- IT Electric charge
(charge-discharge cycling of LiFePO₄ lithium **battery cathode** in EC/DEC contg. LiClO₄)
- IT Secondary **batteries**
(lithium; novel concept for synthesis of improved LiFePO₄ lithium **battery cathode**)
- IT **Battery cathodes**
Sol-gel processing
Synthesis
(novel concept for synthesis of improved LiFePO₄ lithium **battery cathode**)
- IT Particle size
(of improved LiFePO₄ lithium **battery cathode** formed by sol-gel processing)
- IT Microstructure
(of improved LiFePO₄ with added copper or silver powder lithium **battery cathode**)
- IT 96-49-1, Ethylene carbonate 105-58-8, Diethyl carbonate
7791-03-9, Lithium perchlorate
(charge-discharge cycling of LiFePO₄ lithium **battery cathode** in EC/DEC contg. LiClO₄)
- IT 7440-22-4, Silver, uses 7440-50-8, Copper, uses
(fine powder; use in synthesis of improved LiFePO₄ lithium **battery cathode**)
- IT 15365-14-7P, Iron lithium phosphate FeLiPO₄
(novel concept for synthesis of improved LiFePO₄ lithium **battery cathode**)
- IT 50-81-7, Ascorbic acid, reactions 1310-65-2, Lithium hydroxide
7664-38-2, Phosphoric acid, reactions 10421-48-4
(use in synthesis of improved LiFePO₄ lithium **battery**)

cathode)

L55 ANSWER 3 OF 19 HCA COPYRIGHT 2002 ACS

136:388549 Reticulated and controlled porosity **battery**

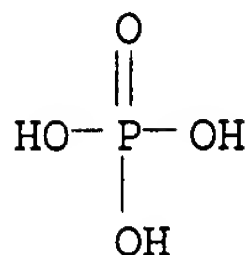
structures. Chiang, Yet-Ming; Hellweg, Benjamin (Massachusetts Institute of Technology, USA). PCT Int. Appl. WO 2002043168 A2 20020530, 44 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2001-US48345 20011022. PRIORITY: US 2000-PV242124 20001020.

AB The effective ionic **cond.** in a composite structure is believed to decrease rapidly with vol. fraction. A system, such as a bipolar device or energy storage device, has structures or components in which the diffusion length or path that electrodes or ions must traverse is minimized and the interfacial area exposed to the ions or electrons is maximized. The device includes components that can be reticulated or has a reticulated interface so that an interface area can be increased. The increased interfacial perimeter increases the available sites for reaction of ionic species. Many different reticulation patterns can be used. The aspect ratio of the reticulated features can be varied. Such bipolar devices can be fabricated by a variety of methods or procedures. A bipolar device having structures of reticulated interface can be tailored for the purposes of controlling and optimizing charge and discharge kinetics. A bipolar device having graded porosity structures can have improved transport properties because the diffusion controlling reaction kinetics can be modified. Graded porosity electrodes can be linearly or nonlinearly graded. A bipolar device having perforated structures also provides improved transport properties by removing tortuosity and **reducing** diffusion distance.

IT 15365-14-7, Iron lithium phosphate FeLiPO_4
(reticulated and controlled porosity **battery**
structures)

RN 15365-14-7 HCA

CN Phosphoric acid, iron(2+) lithium salt (1:1:1) (9CI) (CA INDEX
NAME)



● Fe(II)

● Li

IC ICM H01M004-00
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST **battery** structure reticulated controlled porosity
 IT Vapor deposition process
 (chem.; reticulated and controlled porosity **battery** structures)
 IT Sedimentation (separation)
 (differential; reticulated and controlled porosity **battery** structures)
 IT Polyoxyalkylenes, uses
 (lithium complexes; reticulated and controlled porosity **battery** structures)
 IT **Battery cathodes**
 Evaporation
 Porosity
 Screen printing
 Secondary **batteries**
 Sputtering
 Surface area
 Web materials
 (reticulated and controlled porosity **battery** structures)
 IT Fluoropolymers, uses
 (reticulated and controlled porosity **battery** structures)
 IT Molding
 (tape-casting; reticulated and controlled porosity **battery** structures)
 IT Coating process
 (web; reticulated and controlled porosity **battery** structures)
 IT 91-20-3, Naphthalene, uses
 (pore former; reticulated and controlled porosity **battery** structures)

- structures)
- IT 96-49-1, Ethylene carbonate 616-38-6, Dimethyl carbonate 7429-90-5, Aluminum, uses 7439-93-2D, Lithium, polyethylene oxide complex 7440-22-4, Silver, uses 7440-31-5, Tin, uses 7440-36-0, Antimony, uses 7440-44-0, Carbon, uses 7440-66-6, Zinc, uses 12031-65-1, Lithium nickel oxide LiNiO_2 12057-17-9, Lithium manganese oxide LiMn_2O_4 12057-30-6 12162-79-7, Lithium manganese oxide LiMnO_2 12190-79-3, Cobalt lithium oxide CoLiO_2 12798-95-7 **15365-14-7**, Iron lithium phosphate FeLiPO_4 25322-68-3D, Peo, lithium complexes 144419-56-7, Cobalt lithium magnesium oxide $\text{Co}_{0.95}\text{LiMg}_{0.05}\text{O}_2$ (reticulated and controlled porosity **battery** structures)
- IT 1314-62-1, Vanadium pentoxide, uses 12338-02-2 (reticulated and controlled porosity **battery** structures)
- IT 24937-79-9, PvdF (reticulated and controlled porosity **battery** structures)

L55 ANSWER 4 OF 19 HCA COPYRIGHT 2002 ACS

136:312584 Method for preparation of **cathode** active material for **nonaqueous** lithium secondary **battery**. Sato, Atsushi; Kuyama, Junji; Fukushima, Yuzuru; Hosoya, Mamoru (Sony Corp., Japan). Eur. Pat. Appl. EP 1198019 A2 20020417, 15 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV; FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-123899 20011005. PRIORITY: JP 2000-308299 20001006.

AB A **nonaq. electrolyte cell** includes a **cathode** contg. a **cathode** active material, which is mainly composed of a compd. represented by the general formula Li_xFePO_4 , where $0 < x \leq 1$, with the molar ratio of Li_3PO_4 to a compd. represented by the general formula Li_xFePO_4 , which ratio is represented by $\text{Li}_3\text{PO}_4/\text{LiFePO}_4$, being $\text{Li}_3\text{PO}_4/\text{LiFePO}_4 \leq 6.67$ times. 10-2. Starting materials for the synthesis of compd. Li_xFePO_4 where $0 < x \leq 1$ are Li_3PO_4 and $\text{Fe}_3(\text{PO}_4)_2$ or $\text{Fe}_3(\text{PO}_4)_2 \cdot n\text{H}_2\text{O}$ when n denotes a no. of hydrates.

IT **198782-39-7P**, Iron lithium phosphate ($\text{FeLi}_{0-1}(\text{PO}_4)$) (method for prepn. of **cathode** active material for **nonaq. lithium secondary battery**)

RN 198782-39-7 HCA

CN Iron lithium phosphate ($\text{FeLi}_{0-1}(\text{PO}_4)$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	1	14265-44-2
Li	0 - 1	7439-93-2
Fe	1	7439-89-6

IC ICM H01M004-58

- ICS H01M010-40
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST lithium **nonaq** secondary **battery cathode** prepn
- IT Secondary **batteries**
(lithium; method for prepn. of **cathode** active material for **nonaq.** lithium secondary **battery**)
- IT **Battery cathodes**
Battery electrolytes
(method for prepn. of **cathode** active material for **nonaq.** lithium secondary **battery**)
- IT Fluoropolymers, uses
(method for prepn. of **cathode** active material for **nonaq.** lithium secondary **battery**)
- IT 10028-23-6, Phosphoric acid, iron(2+) salt (2:3)octahydrate
10377-52-3, Trilithium phosphate 14940-41-1, Iron phosphate
fe3(po4)2 31096-55-6, Phosphoric acid, iron(2+) salt (2:3) hydrate
(method for prepn. of **cathode** active material for **nonaq.** lithium secondary **battery**)
- IT 108-32-7, Propylene carbonate 616-38-6, Dimethyl carbonate
7782-42-5, Graphite, uses 21324-40-3, Lithium hexafluorophosphate
(method for prepn. of **cathode** active material for **nonaq.** lithium secondary **battery**)
- IT 198782-39-7P, Iron lithium phosphate (FeLi0-1(PO4))
(method for prepn. of **cathode** active material for **nonaq.** lithium secondary **battery**)
- IT 9011-17-0, Hexafluoropropylene-vinylidene fluoride copolymer
24937-79-9, PvdF
(method for prepn. of **cathode** active material for **nonaq.** lithium secondary **battery**)

L55 ANSWER 5 OF 19 HCA COPYRIGHT 2002 ACS

136:297395 Method for fabrication of **cathode** active material and a **nonaqueous electrolyte battery**.

Hosoya, Mamoru; Fukushima, Yuzuru; Sakai, Hidecki; Kuyama, Junji
(Sony Corporation, Japan). Eur. Pat. Appl. EP 1195827 A2 20020410, 31 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English).
CODEN: EPXXDW. APPLICATION: EP 2001-123894 20011005. PRIORITY: JP 2000-308300 20001006; JP 2000-308313 20001006.

AB The invention comprises a method for producing a **cathode** active material having superior cell characteristics through single-phase synthesis of a composite material composed of a compd. represented by the general formula $\text{Li}_x\text{Fe}_1\text{-yMyPO}_4$ and a carbon material pos. and a method for producing a **non-aq** . **electrolyte cell** employing the so produced **cathode** active material. To this end, the **cathode** active material is prepd. by a step of mixing the starting materials for synthesis of the compd. represented by the general formula $\text{Li}_x\text{Fe}_1\text{-yMyPO}_4$, a step of milling a mixt. obtained by the mixing step, a step of compressing the mixt. obtained by the mixing step to

a preset d. and a step of sintering the mixt. obtained by the compressing step. A carbon material is added in any one of the above steps prior to the sintering step. The d. of the mixt. in the compressing step is set to not less than 1.71 g/cm³ and not larger than 2.45 g/cm³.

IT 198782-39-7, Iron lithium phosphate (FeLi0-1(PO4))
(method for fabrication of **cathode** active material and
nonaq. electrolyte battery)
RN 198782-39-7 HCA
CN Iron lithium phosphate (FeLi0-1(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	1	14265-44-2
Li	0 - 1	7439-93-2
Fe	1	7439-89-6

IC ICM H01M004-58

ICS H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **cathode** active material **nonaq**
electrolyte battery

IT Ball milling

Battery cathodes

Composites

Secondary **batteries**

(method for fabrication of **cathode** active material and
nonaq. electrolyte battery)

IT Carbon black, uses

(method for fabrication of **cathode** active material and
nonaq. electrolyte battery)

IT 7440-44-0, Carbon, uses 198782-39-7, Iron lithium phosphate (FeLi0-1(PO4)) 407606-22-8, Chromium iron lithium phosphate (Cr0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-24-0, Cobalt iron lithium phosphate (Co0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-26-2, Copper iron lithium phosphate (Cu0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-28-4, Aluminum iron lithium phosphate (Al0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-30-8, Gallium iron lithium phosphate (Ga0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-32-0, Boron iron lithium phosphate (B0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-34-2, Iron lithium manganese phosphate (Fe0.2-1Li0.05-1.2Mn0-0.8(PO4)) 407606-36-4, Iron lithium nickel phosphate (Fe0.2-1Li0.05-1.2Ni0-0.8(PO4)) 407606-39-7, Iron lithium vanadium phosphate (Fe0.2-1Li0.05-1.2V0-0.8(PO4)) 407606-42-2, Iron lithium molybdenum phosphate (Fe0.2-1Li0.05-1.2Mo0-0.8(PO4)) 407606-44-4, Iron lithium titanium phosphate (Fe0.2-1Li0.05-1.2Ti0-0.8(PO4)) 407606-47-7, Iron lithium zinc phosphate (Fe0.2-1Li0.05-1.2Zn0-0.8(PO4)) 407606-49-9, Iron lithium magnesium phosphate (Fe0.2-1Li0.05-1.2Mg0-0.8(PO4)) 407606-51-3, Iron lithium niobium phosphate (Fe0.2-1Li0.05-1.2Nb0-0.8(PO4)) 407629-87-2 407629-90-7

- 407629-95-2 407630-01-7 407630-10-8 407630-14-2
 (method for fabrication of **cathode** active material and
nonaq. electrolyte battery)
- IT 15365-14-7P, Iron lithium phosphate FeLiPO_4
 (method for fabrication of **cathode** active material and
nonaq. electrolyte battery)
- IT 9011-17-0, Hexafluoropropylene-vinylidene fluoride copolymer
 (method for fabrication of **cathode** active material and
nonaq. electrolyte battery)
- L55 ANSWER 6 OF 19 HCA COPYRIGHT 2002 ACS
 136:281939 **Nonaqueous electrolyte battery**
cathode active material capable of reversibly
 doping/undoping lithium. Hosoya, Mamoru; Takahashi, Kimio;
 Fukushima, Yuzuru (Sony Corporation, Japan). Eur. Pat. Appl. EP
 1193787 A2 20020403, 16 pp. DESIGNATED STATES: R: AT, BE, CH, DE,
 DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI,
 RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-123181
 20010927. PRIORITY: JP 2000-301399 20000929.
- AB An LiFePO_4 carbon composite material is to be synthesized in a
 single phase to realize superior cell characteristics. To this end,
 in the prepn. of a **cathode** active material, starting
 materials for synthesis of a compd. having the formula Li_xFePO_4 ,
 where $0 < x \leq 1$, are mixed together, milled and sintered. A
 carbon material is added at one of these steps. As the starting
 materials for synthesis for Li_xFePO_4 , Li_3PO_4 , Fe_3PO_4 , $\text{Fe}_3(\text{PO}_4)_2$ or
 its hydrate $\text{Fe}_3(\text{PO}_4)_2 \cdot n\text{H}_2\text{O}$, where n is the no. of hydrates,
 are used, and the content of Fe^{3+} in the total iron in $\text{Fe}_3(\text{PO}_4)_2$ or
 its hydrate $\text{Fe}_3(\text{PO}_4)_2 \cdot n\text{H}_2\text{O}$ is set to 61 wt% or less.
- IT 198782-39-7P, Iron lithium phosphate ($\text{FeLi}_{0-1}(\text{PO}_4)$)
(nonaq. electrolyte battery
cathode active material capable of reversibly
 doping/undoping lithium)
- RN 198782-39-7 HCA
 CN Iron lithium phosphate ($\text{FeLi}_{0-1}(\text{PO}_4)$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	1	14265-44-2
Li	0 - 1	7439-93-2
Fe	1	7439-89-6

- IC ICM H01M004-58
 ICS H01M010-40
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy
 Technology)
- ST **battery cathode** lithium iron phosphate carbon
 composite
- IT Secondary **batteries**
 (lithium; **nonaq. electrolyte battery**
cathode active material capable of reversibly

- doping/undoping lithium)
- IT Ball milling
Battery cathodes
Composites
Sintering
(nonaq. electrolyte battery
cathode active material capable of reversibly
doping/undoping lithium)
- IT Carbonaceous materials (technological products)
(nonaq. electrolyte battery
cathode active material capable of reversibly
doping/undoping lithium)
- IT Fluoropolymers, uses
(nonaq. electrolyte battery
cathode active material capable of reversibly
doping/undoping lithium)
- IT 10028-23-6, Phosphoric acid, iron(2+) salt (2:3) octahydrate
10045-86-0, Ferric phosphate 10377-52-3, Lithium phosphate Li_3PO_4
31096-55-6
(nonaq. electrolyte battery
cathode active material capable of reversibly
doping/undoping lithium)
- IT 96-49-1, Ethylene carbonate 108-32-7, Propylene carbonate
7439-93-2, Lithium, uses 7440-44-0, Carbon, uses 7782-42-5,
Graphite, uses 9011-17-0, Hexafluoropropylene-vinylidene fluoride
copolymer 15365-14-7, Iron lithium phosphate FeLiPO_4 21324-40-3,
Lithium hexafluorophosphate
(nonaq. electrolyte battery
cathode active material capable of reversibly
doping/undoping lithium)
- IT 24937-79-9, PvdF
(nonaq. electrolyte battery
cathode active material capable of reversibly
doping/undoping lithium)
- IT 198782-39-7P, Iron lithium phosphate ($\text{FeLiO-1(PO}_4\text{)}$)
(nonaq. electrolyte battery
cathode active material capable of reversibly
doping/undoping lithium)
- IT 872-36-6, Vinylene carbonate
(nonaq. electrolyte battery
cathode active material capable of reversibly
doping/undoping lithium)

L55 ANSWER 7 OF 19 HCA COPYRIGHT 2002 ACS

136:281938 **Nonaqueous electrolyte battery**

cathode active material capable of reversibly
doping/undoping lithium. Hosoya, Mamoru; Takahashi, Kimio;
Fukushima, Yuzuru (Sony Corporation, Japan). Eur. Pat. Appl. EP
1193786 A2 20020403, 15 pp. DESIGNATED STATES: R: AT, BE, CH, DE,
DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI,
RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-123180
20010927. PRIORITY: JP 2000-301401 20000929.

AB A LiFePO_4 carbon composite material is to be synthesized in a single phase satisfactorily to achieve superior cell characteristics. In prepg. a **cathode** active material, starting materials for synthesis of a compd. represented by the general formula Li_xFePO_4 , where $0 < x \leq 1$, are mixed, milled and a carbon material is added to the resulting mass at an optional time point in the course of mixing, milling and sintering. Li_3PO_4 , $\text{Fe}_3(\text{PO}_4)_2$ or its hydrates $\text{Fe}_3(\text{PO}_4)_2 \cdot n\text{H}_2\text{O}$, where n denotes the no. of hydrates, are used as the starting materials for synthesis of Li_xFePO_4 . The temp. of a product from the sintering is set to 305.degree. or less when the product from the sintering is exposed to atm. The oxygen concn. in a sintering atm. is set to 1012 ppm in vol. or less at the time point of sintering.

IT 198782-39-7P, Iron lithium phosphate ($\text{FeLi}_{0-1}(\text{PO}_4)$)
 (nonaq. electrolyte battery
 cathode active material capable of reversibly
 doping/undoping lithium)

RN 198782-39-7 HCA

CN Iron lithium phosphate ($\text{FeLi}_{0-1}(\text{PO}_4)$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	1	14265-44-2
Li	0 - 1	7439-93-2
Fe	1	7439-89-6

IC ICM H01M004-58
 ICS H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **battery cathode** lithium iron phosphate carbon composite

IT Secondary **batteries**
 (lithium; nonaq. electrolyte battery
 cathode active material capable of reversibly
 doping/undoping lithium)

IT **Battery cathodes**
 Composites
 Sintering
 (nonaq. electrolyte battery
 cathode active material capable of reversibly
 doping/undoping lithium)

IT Carbon black, uses
 Carbonaceous materials (technological products)
 (nonaq. electrolyte battery
 cathode active material capable of reversibly
 doping/undoping lithium)

IT Fluoropolymers, uses
 (nonaq. electrolyte battery
 cathode active material capable of reversibly
 doping/undoping lithium)

- IT Ball milling
(planetary; **nonaq. electrolyte battery cathode** active material capable of reversibly doping/undoping lithium)
- IT 10028-23-6, Phosphoric acid, iron(2+) salt (2:3) octahydrate
10377-52-3, Lithium phosphate 14940-41-1, Iron phosphate $\text{Fe}_3(\text{PO}_4)_2$
31096-55-6
(**nonaq. electrolyte battery cathode** active material capable of reversibly doping/undoping lithium)
- IT 96-49-1, Ethylene carbonate 108-32-7, Propylene carbonate
616-38-6, Dimethyl carbonate 7439-93-2, Lithium, uses 7782-42-5,
Graphite, uses 21324-40-3, Lithium hexafluorophosphate
(**nonaq. electrolyte battery cathode** active material capable of reversibly doping/undoping lithium)
- IT 872-36-6, Vinylene carbonate 7440-44-0, Carbon, uses 9011-17-0,
Hexafluoropropylene-vinylidene fluoride copolymer 24937-79-9,
Poly(vinylidene fluoride)
(**nonaq. electrolyte battery cathode** active material capable of reversibly doping/undoping lithium)
- IT 15365-14-7P, Iron lithium phosphate FeLiO_4 198782-39-7P,
Iron lithium phosphate (FeLiO_4)
(**nonaq. electrolyte battery cathode** active material capable of reversibly doping/undoping lithium)
- IT 7782-44-7, Oxygen, uses
(**nonaq. electrolyte battery cathode** active material capable of reversibly doping/undoping lithium)

L55 ANSWER 8 OF 19 HCA COPYRIGHT 2002 ACS

136:281937 **Nonaqueous electrolyte battery**

with **cathode** active material capable of reversibly doping/undoping lithium. Hosoya, Mamoru; Takahashi, Kimio; Fukushima, Yuzuru (Sony Corporation, Japan). Eur. Pat. Appl. EP 1193785 A2 20020403, 16 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-122769 20010921. PRIORITY: JP 2000-301402 20000929.

AB A LiFePO_4 carbon composite material is to be synthesized in a single phase satisfactorily to prevent the deterioration of the performance of the **cathode** active material from occurring and achieve superior cell characteristics. In prep. a **cathode** active material, starting materials for synthesis of a compd. represented by the general formula Li_xFePO_4 , where $0 < x \leq 1$, are mixed, milled and a carbon material is added to the resulting mass at an optional time point in the course of mixing, milling and sintering. Li_3PO_4 , $\text{Fe}_3(\text{PO}_4)_2$ or its hydrates $\text{Fe}_3(\text{PO}_4)_2 \cdot n\text{H}_2\text{O}$, where n denotes the no. of hydrates, are used as the starting materials for synthesis of Li_xFePO_4 . The temp. of a product from the sintering is

set to 305.degree. or less when the product from the sintering is exposed to atm.

IT 198782-39-7P, Iron lithium phosphate (FeLiO-1(PO4))
 (nonaq. electrolyte battery with
 cathode active material capable of reversibly
 doping/undoping lithium)
 RN 198782-39-7 HCA
 CN Iron lithium phosphate (FeLiO-1(PO4)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	1	14265-44-2
Li	0 - 1	7439-93-2
Fe	1	7439-89-6

IC ICM H01M004-58
 ICS H01M010-40
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy
 Technology)
 ST battery cathode lithium iron phosphate carbon
 composite
 IT Secondary batteries
 (lithium; nonaq. electrolyte battery
 with cathode active material capable of reversibly
 doping/undoping lithium)
 IT Battery cathodes
 Composites
 (nonaq. electrolyte battery with
 cathode active material capable of reversibly
 doping/undoping lithium)
 IT Carbonaceous materials (technological products)
 (nonaq. electrolyte battery with
 cathode active material capable of reversibly
 doping/undoping lithium)
 IT Fluoropolymers, uses
 (nonaq. electrolyte battery with
 cathode active material capable of reversibly
 doping/undoping lithium)
 IT Ball milling
 (planetary; nonaq. electrolyte
 battery with cathode active material capable of
 reversibly doping/undoping lithium)
 IT 10377-52-3, Lithium phosphate li3po4 14940-41-1, Iron phosphate
 fe3(po4)2 31096-55-6
 (nonaq. electrolyte battery with
 cathode active material capable of reversibly
 doping/undoping lithium)
 IT 96-49-1, Ethylene carbonate 108-32-7, Propylene carbonate
 616-38-6, Dimethyl carbonate 872-36-6, Vinylene carbonate
 7439-93-2, Lithium, uses 7782-42-5, Graphite, uses 9011-17-0,
 Hexafluoropropylene-vinylidene fluoride copolymer 21324-40-3,

- Lithium hexafluorophosphate
(**nonaq. electrolyte battery** with
cathode active material capable of reversibly
doping/undoping lithium)
- IT 7440-44-0, Carbon, uses 24937-79-9, PvdF
(**nonaq. electrolyte battery** with
cathode active material capable of reversibly
doping/undoping lithium)
- IT 15365-14-7P, Iron lithium phosphate FeLiPO_4 198782-39-7P,
Iron lithium phosphate ($\text{FeLiO-1(PO}_4\text{)}$)
(**nonaq. electrolyte battery** with
cathode active material capable of reversibly
doping/undoping lithium)
- L55 ANSWER 9 OF 19 HCA COPYRIGHT 2002 ACS
- 136:265826 Method for the preparation of **cathode** active
material for a **nonaqueous electrolyte**
battery. Hosoya, Mamoru; Takahashi, Kimio; Fukushima,
Yuzuru (Sony Corporation, Japan). Eur. Pat. Appl. EP 1193784 A2
20020403, 16 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR,
GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO.
(English). CODEN: EPXXDW. APPLICATION: EP 2001-122752 20010921.
PRIORITY: JP 2000-301403 20000929.
- AB A LiFePO_4 carbon composite material is to be synthesized in a single
phase satisfactorily to achieve superior cell characteristics. In
prepg. a **cathode** active material, a starting material for
synthesis of a compd. represented by the general formula Li_xFePO_4 ,
where $0 < x < 1$, is mixed, milled and sintered and a carbon
material is added to the resulting mass at an optional time point in
the course of mixing, milling and sintering. Li_3PO_4 , $\text{Fe}_3(\text{PO}_4)_2$ or
its hydrates $\text{Fe}_3(\text{PO}_4)_2 \cdot n\text{H}_2\text{O}$, where n denotes the no. of
hydrates, are used as the starting material for synthesis of
 Li_xFePO_4 . The particle size distribution of particles of the
starting material for synthesis following the milling with the
particle size not less than 3 μm is set to 2.2% or less in terms
of the volumetric integration frequency.
- IT 198782-39-7P, Iron lithium phosphate ($\text{FeLiO-1(PO}_4\text{)}$)
(method for prepn. of **cathode** active material for
nonaq. electrolyte battery)
- RN 198782-39-7 HCA
- CN Iron lithium phosphate ($\text{FeLiO-1(PO}_4\text{)}$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	1	14265-44-2
Li	0 - 1	7439-93-2
Fe	1	7439-89-6

IC ICM H01M004-58

ICS H01M010-40

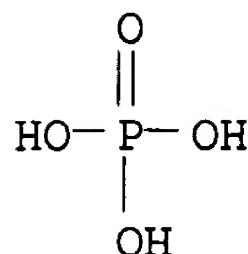
CC 52-2 (Electrochemical, Radiational, and Thermal Energy

- Technology)
- ST **battery cathode** lithium iron phosphate carbon composite
- IT **Secondary batteries**
(lithium; method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
- IT **Battery cathodes**
Particle size distribution
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
- IT Carbon black, uses
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
- IT Ball milling
(planetary; method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
- IT 108-32-7, Propylene carbonate 616-38-6, Dimethyl carbonate 9011-17-0, Hexafluoropropylene-vinylidene fluoride copolymer 21324-40-3, Lithium hexafluorophosphate
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
- IT 7440-44-0, Carbon, uses
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)
- IT 15365-14-7P, Iron lithium phosphate FeLiPO_4 198782-39-7P, Iron lithium phosphate ($\text{FeLiO-1(PO}_4\text{)}$)
(method for prepn. of **cathode** active material for **nonaq. electrolyte battery**)

L55 ANSWER 10 OF 19 HCA COPYRIGHT 2002 ACS

134:334625 Lithium ion **conduction** in $\text{LiTi}_2(\text{PO}_4)_3$. Takada, K.; Tansho, M.; Yanase, I.; Inada, T.; Kajiyama, A.; Kouguchi, M.; Kondo, S.; Watanabe, M. (National Institute for Research in Inorganic Materials, Tsukuba, Ibaraki, 305-0044, Japan). Solid State Ionics, 139(3,4), 241-247 (English) 2001. CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier Science B.V..

- AB Li^+ ion **conduction** was examd. for a mixt. of $\text{LiTi}_2(\text{PO}_4)_3$ (LTP) and a glassy **electrolyte**, $0.01\text{Li}_3\text{PO}_4\text{-}0.63\text{Li}_2\text{S-}0.36\text{SiS}_2$. The addn. of LTP with 10 wt. % Resulted in a significant decrease in activation energy for **conduction** and little influence on the Li^+ ion **cond.**, although it **reduced** the **conduction** path in the glass. The ^7Li NMR spectra of LTP was quite similar to that of $\text{Li}_{1.3}\text{Al}_{0.3}\text{Ti}_{1.7}(\text{PO}_4)_3$ (LATP) with a high **cond.** of $10^{-3} \text{ S cm}^{-1}$. These results suggest that Li^+ ion **conduction** in LTP is as high as that in the glassy **electrolyte** and LATP.
- IT 30622-39-0, Lithium titanium phosphate ($\text{LiTi}_2(\text{PO}_4)_3$)
(lithium ion **conduction** in $\text{LiTi}_2(\text{PO}_4)_3$)
- RN 30622-39-0 HCA
- CN Phosphoric acid, lithium titanium(4+) salt (3:1:2) (8CI, 9CI) (CA INDEX NAME)



● 1/3 Li

● 2/3 Ti(IV)

CC 76-1 (Electric Phenomena)
 ST lithium ion **conduction** lithium titanium phosphate
 IT Ionic **conductivity**
 NMR (nuclear magnetic resonance)
 (lithium ion **conduction** in $\text{LiTi}_2(\text{PO}_4)_3$)
 IT 10377-52-3, Lithium phosphate (Li_3PO_4) 12136-58-2, Lithium sulfide
 (Li_2S) 13759-10-9, Silicon sulfide (SiS_2) 17341-24-1,
 Lithium(1+), properties 30622-39-0, Lithium titanium
 phosphate ($\text{LiTi}_2(\text{PO}_4)_3$)
 (lithium ion **conduction** in $\text{LiTi}_2(\text{PO}_4)_3$)
 L55 ANSWER 11 OF 19 HCA COPYRIGHT 2002 ACS
 134:210598 Preparation of lithium-containing phosphates for
battery use. Barker, Jeremy; Saidi, M. Yazid (Valence
 Technology, Inc., USA). U.S. US 6203946 B1 20010320, 13 pp.
 (English). CODEN: USXXAM. APPLICATION: US 1998-204944 19981203.
 AB The invention provides an **electrochem. cell**
 which comprises a first electrode and a second electrode which is a
 counter electrode to the first electrode. The first electrode
 comprises a phosphorous compd. of the nominal general formula
 $\text{Li}_3\text{E}'\text{aE}''\text{b}(\text{PO}_4)_3$, desirably at least one E is a metal; and
 preferably, $\text{Li}_3\text{M}'\text{M}''(\text{PO}_4)_3$. E' and E'' are the same or different from
 one another. Where E' and E'' are the same, they are preferably
 metals having more than one oxidn. state. Where E' and E'' are
 different from one another, they are preferably selected from the
 group of metals where at least one of E' and E'' has more than one
 oxidn. state.
 IT 329025-35-6P, Iron lithium phosphate ($\text{Fe}_2\text{Li}_{1-3}(\text{PO}_4)_3$)
 (prepn. of lithium-contg. phosphates for **battery** use)
 RN 329025-35-6 HCA
 CN Iron lithium phosphate ($\text{Fe}_2\text{Li}_{1-3}(\text{PO}_4)_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
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=====+=====+=====
O4P      |          3          |          14265-44-2
Li       |          1 - 3        |          7439-93-2
Fe       |          2            |          7439-89-6
=====+=====+=====

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IC ICM H01M004-58
ICS H01M004-48

NCL 429231100

CC 52-2 (Electrochemical, Radiational, and Thermal Energy
Technology)

ST **battery** electrode lithium contg phosphate

IT Secondary **batteries**

(lithium; prepn. of lithium-contg. phosphates for **battery**
use)

IT **Battery cathodes**

(prepn. of lithium-contg. phosphates for **battery** use)

IT 96-49-1, Ethylene carbonate 616-38-6, Dimethyl carbonate
(prepn. of lithium-contg. phosphates for **battery** use)

IT 36058-25-0P, Iron lithium phosphate $\text{Fe}_2\text{Li}_3(\text{PO}_4)_3$ 69104-85-4P,
Chromium lithium phosphate $\text{Cr}_2\text{Li}_3(\text{PO}_4)_3$ 204653-30-5P, Lithium
vanadium phosphate $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ 285564-74-1P **329025-35-6P**
, Iron lithium phosphate ($\text{Fe}_2\text{Li}_{1-3}(\text{PO}_4)_3$) 329025-36-7P
329025-38-9P 329025-39-0P

(prepn. of lithium-contg. phosphates for **battery** use)

IT 554-13-2, Lithium carbonate 1310-65-2, Lithium hydroxide
1314-62-1, Vanadium pentoxide, reactions 7783-28-0, Diammonium
hydrogen phosphate 7790-69-4, Lithium nitrate
(prepn. of lithium-contg. phosphates for **battery** use)

L55 ANSWER 12 OF 19 HCA COPYRIGHT 2002 ACS

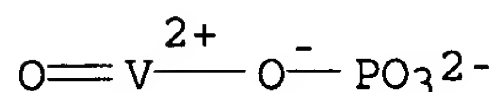
133:337629 Highly reversible Li insertion at 4 V in .epsilon.-
VOPO4/.alpha.-LiVOPO4 **cathodes**. Kerr, T. A.; Gaubicher,
J.; Nazar, L. F. (Department of Chemistry, University of Waterloo,
Waterloo, ON, N2L 3G1, Can.). Electrochemical and Solid-State
Letters, 3(10), 460-462 (English) 2000. CODEN: ESLEF6. ISSN:
1099-0062. Publisher: Electrochemical Society.

AB Electrochem. (and chem.) lithium intercalation into a new vanadium
phosphate, .epsilon.-VOPO4, is a two-phase process involving
redn. of VV to VIV at an attractive potential (3.95V).
X-ray diffraction shows that this material and that obtained from
LiI **redn.** are structurally similar to high-temp.
.alpha.-LiVOPO4. Increased stability and capacity are achieved with
chem. lithiated .epsilon.-VOPO4 when contact with the
conductive additive is enhanced by mech. grinding.
Following the first charge cycle, reversible electrochem. lithium
extn./insertion at a cycling rate of C/10 affords a specific
capacity of over 100 mAh/g (3.0-4.5 V window) that is stable for at
least 100 cycles. This material demonstrates the best overall
properties, thus far. of any polyanionic vanadium phosphate
structure.

IT 83348-01-0

(highly reversible Li insertion in .epsilon.-VOP04/.alpha.-

LiVOP04 **cathodes**)
 RN 83348-01-0 HCA
 CN Vanadate(1-), oxo[phosphato(3-)-.kappa.O]-, lithium (9CI) (CA INDEX NAME)



● Li⁺

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 72
 ST lithium intercalation vanadium phosphate **cathode battery**
 IT **Battery cathodes**
 Crystal structure
 Intercalation
 (highly reversible Li insertion in .epsilon.-VOPO4/.alpha.-LiVOP04 **cathodes**)
 IT Secondary **batteries**
 (lithium; highly reversible Li insertion in .epsilon.-VOPO4/.alpha.-LiVOP04 **cathodes**)
 IT 10377-51-2, Lithium iodide (LiI) 12359-27-2 **83348-01-0**
 (highly reversible Li insertion in .epsilon.-VOPO4/.alpha.-LiVOP04 **cathodes**)

L55 ANSWER 13 OF 19 HCA COPYRIGHT 2002 ACS
 133:298811 Method for manufacturing active material of positive plate for **nonaqueous electrolyte secondary cell**. Li, Guohua; Yamada, Atsuo (Sony Corporation, Japan). PCT Int. Appl. WO 2000060679 A1 20001012, 88 pp. DESIGNATED STATES: W: CA, CN, JP, KR, US; RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE. (Japanese). CODEN: PIXXD2. APPLICATION: WO 2000-JP1915 20000328. PRIORITY: JP 1999-99407 19990406; JP 1999-274746 19990928; JP 1999-274747 19990928.
 AB A method for manufg. an active material of a pos. plate which is doped/dedoped well reversely with/of lithium comprises mixing materials including a **reducing** agent to be used as a synthetic material of a compd. whose compn. is expressed by a general formula $\text{Li}_x\text{M}_y\text{PO}_4$ (where $0 < x \leq 2$, $0.8 \leq y \leq 1.2$, and M is at least one element selected from 3d-transition metals) to produce a precursor and firing the precursor..
 IT **213467-46-0P**, Iron lithium manganese phosphate (FeLi₂Mn(PO₄)₂)
 (manuf. of active material of pos. plate for **nonaq. electrolyt secondary cell**)

RN 213467-46-0 HCA
 CN Iron lithium manganese phosphate ($\text{FeLi}_2\text{Mn}(\text{PO}_4)_2$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	2	14265-44-2
Mn	1	7439-96-5
Li	2	7439-93-2
Fe	1	7439-89-6
IC	ICM H01M004-58 ICS H01M010-40; H01M004-04	
CC	52-2 (Electrochemical, Radiational, and Thermal Energy Technology)	
ST	pos electrode lithium dopant secondary cell; secondary cell nonaq electrolyte pos electrode	
IT	Secondary batteries (nonaq. electrolyte; method for manufg. active material of pos. plate for nonaq. electrolyte secondary cell)	
IT	Battery electrodes (pos.; method for manufg. active material of pos. plate for nonaq. electrolyte secondary cell)	
IT	554-13-2, Lithium carbonate 3094-87-9, Ferrous acetate 6047-25-2, Ferrous oxalate dihydrate 6156-78-1, Manganese acetate tetrahydrate 7722-76-1, Ammonium dihydrogen phosphate (in manuf. of active material of pos. plate for nonaq. electrolyte secondary cell)	
IT	13826-59-0P, Lithium manganese phosphate 213467-46-0P, Iron lithium manganese phosphate ($\text{FeLi}_2\text{Mn}(\text{PO}_4)_2$) (manuf. of active material of pos. plate for nonaq. electrolyte secondary cell)	
IT	13816-45-0P, Triphylite ($\text{FeLi}(\text{PO}_4)$) (method for manufg. active material of pos. plate for nonaq. electrolyte secondary cell)	

L55 ANSWER 14 OF 19 HCA COPYRIGHT 2002 ACS
 132:38039 Supercapacitors and **batteries**. Goodenough, J. B.; Lee, Hee Y.; Manivannan, V. (Texas Materials Institute, ETC 9.102, University of Texas at Austin, Austin, TX, 78712-1063, USA). Materials Research Society Symposium Proceedings, 548(Solid State Ionics V), 655-665 (English) 1999. CODEN: MRSPDH. ISSN: 0272-9172. Publisher: Materials Research Society.
 AB Comparisons are made between the material requirements for supercapacitor electrodes and the **cathode** of a lithium-ion **battery**. The performances of the **battery cathodes** $\text{Li}_{1+x}\text{Fe}_2(\text{SO}_4)_2(\text{PO}_4)$ and $\text{Li}_{1+x}\text{VMoO}_6$ are compared to

those for supercapacitor electrodes operating with 5.3M H₂SO₄, Nafion 117, or 2M KCl aq. soln. at pH 6.7. The use of a KCl aq. **electrolyte** at mild pH allows stabilization of amorphous, hydrated electrode materials such as a-MnO₂.nH₂O that are not stable in 5.3M H₂SO₄ or with Nafion 117. However, the larger K⁺ ion appears to **reduce** by a factor of three the theor. capacity attainable with H⁺ ions.

IT 205380-60-5D, Iron lithium phosphate sulfate
(Fe₂LiPO₄(SO₄)₂), lithium-intercalated
(materials for supercapacitor electrodes and lithium
battery cathodes)
RN 205380-60-5 HCA
CN Iron lithium phosphate sulfate (Fe₂Li(PO₄)(SO₄)₂) (9CI) (CA INDEX
NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4S	2	14808-79-8
O4P	1	14265-44-2
Li	1	7439-93-2
Fe	2	7439-89-6

CC 52-2 (Electrochemical, Radiational, and Thermal Energy
Technology)
ST supercapacitor electrode lithium **battery cathode**
IT Capacitors
(double layer; materials for supercapacitor electrodes and
lithium **battery cathodes**)
IT Secondary **batteries**
(lithium; materials for supercapacitor electrodes and lithium
battery cathodes)
IT **Battery cathodes**
Electrodes
(materials for supercapacitor electrodes and lithium
battery cathodes)
IT 12169-23-2, Thorium titanium oxide (ThTi₂O₆) 12299-92-2D, Lithium
molybdenum vanadium oxide (LiMoVO₆), lithium-intercalated
26088-58-4, Manganese dioxide hydrate 32740-79-7, Ruthenium
dioxide hydrate 36058-25-0D, Iron lithium phosphate
(Fe₂Li₃(PO₄)₃), lithium-intercalated 51312-22-2, Manganese
potassium oxide hydrate 174015-34-0D, Iron lithium sulfate
(Fe₂Li(SO₄)₃), lithium-intercalated 205380-60-5D, Iron
lithium phosphate sulfate (Fe₂LiPO₄(SO₄)₂), lithium-intercalated
(materials for supercapacitor electrodes and lithium
battery cathodes)
IT 7447-40-7, Potassium chloride, uses 7664-93-9, Sulfuric acid, uses
66796-30-3, Nafion 117
(materials for supercapacitor electrodes and lithium
battery cathodes)

130:156101 Secondary lithium **batteries** inhibiting lithium dendrite generation and electronic apparatus using the **batteries**. Ikgawa, Akiko; Tsuruoka, Shigeo; Takeuchi, Seiji; Yoshikawa, Masanori; Muranaka, Kiyoshi (Hitachi, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 11016571 A2 19990122 Heisei, 9 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1997-165588 19970623.

AB The **batteries** use mixed oxides $AwNvNixMyO_2$ (A = alkali metal; N = Mg, P; M = Mn, Co, Al; w = 0.05-1.2; v = 0.0001-0.02; x = 0.6-0.95; y = 0.005-0.4) as **cathode** active mass and carbon materials as anode active mass, whereas the carbon materials contain elements capable of forming compds. with alkali metals and contain another elements which do not form compds. with the alkali metals. The reactive elements may be selected from Pb, Sn, Al, Si, In, Ga, Ag, B, and Mg, and the inert elements may be selected from Fe, Cu, Co, Ni, P, S, and Se. Elec. app. equipped with the **batteries** are claimed. The elec. app. involve note-sized or pocket-sized personal computers and word processors, elec. book players, pen-input personal computers, (portable) telephones and copying machines, pagers, electronic diaries, calculators, liq. crystal televisions, electronic tools, translators, transceivers, memory cards, back-up power sources, tape recorders, radios, headphone stereophonic recorders, portable printers, handy cleaners, portable CD, video cassette recorders, road map-navigation systems, refrigerators, air conditioners, televisions, water-heating appliances, electronic ovens, dish washers, laundry machines, drying machines, game machines, lighting fitting, toys, road conditioners, medical equipments, (elec.) automobiles, elec. power-storage systems,. The reactive elements react with alkali metals (i.e., Li) to prevent generation of alkali metal dendrite in overcharging, while the formed compds. discharge the alkali metals in overdischarging to prevent **redn.** of the **electrolytes**.

IT 220179-38-4, Cobalt lithium nickel oxide phosphate ($Co_{0.3}Li_{0.05-1.2}Ni_{0.7}O_{1.96}(PO_4)_{0.01}$) 220179-44-2
220179-46-4, Lithium manganese nickel oxide phosphate ($Li_{0.05-1.2}Mn_{0.3}Ni_{0.7}O_{1.96}(PO_4)_{0.01}$) 220179-48-6
220179-52-2, Aluminum lithium nickel oxide phosphate ($Al_{0.3}Li_{0.05-1.2}Ni_{0.7}O_{1.96}(PO_4)_{0.01}$) 220179-54-4
(**cathodes**; secondary Li **batteries** using carbon anodes and alkali metal nickel oxide **cathodes**)

RN 220179-38-4 HCA

CN Cobalt lithium nickel oxide phosphate ($Co_{0.3}Li_{0.05-1.2}Ni_{0.7}O_{1.96}(PO_4)_{0.01}$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O	1.96	17778-80-2
O4P	0.01	14265-44-2
Co	0.3	7440-48-4
Ni	0.7	7440-02-0

Li | 0.05 - 1.2 | 7439-93-2

RN 220179-44-2 HCA

CN Cobalt lithium magnesium nickel oxide phosphate (Co0.1Li0.05-1.2Mg0.01Ni0.9O1.96(PO4)0.01) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	1.96	17778-80-2
O4P	0.01	14265-44-2
Co	0.1	7440-48-4
Ni	0.9	7440-02-0
Mg	0.01	7439-95-4
Li	0.05 - 1.2	7439-93-2

RN 220179-46-4 HCA

CN Lithium manganese nickel oxide phosphate (Li0.05-1.2Mn0.3Ni0.7O1.96(PO4)0.01) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	1.96	17778-80-2
O4P	0.01	14265-44-2
Ni	0.7	7440-02-0
Mn	0.3	7439-96-5
Li	0.05 - 1.2	7439-93-2

RN 220179-48-6 HCA

CN Lithium magnesium manganese nickel oxide phosphate (Li0.05-1.2Mg0.01Mn0.2Ni0.8O1.96(PO4)0.01) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	1.96	17778-80-2
O4P	0.01	14265-44-2
Ni	0.8	7440-02-0
Mn	0.2	7439-96-5
Mg	0.01	7439-95-4
Li	0.05 - 1.2	7439-93-2

RN 220179-52-2 HCA

CN Aluminum lithium nickel oxide phosphate (Al0.3Li0.05-1.2Ni0.7O1.96(PO4)0.01) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	1.96	17778-80-2
O4P	0.01	14265-44-2

Ni	0.7	7440-02-0
Li	0.05 - 1.2	7439-93-2
Al	0.3	7429-90-5

RN 220179-54-4 HCA

CN Aluminum lithium magnesium nickel oxide phosphate
 (Al_{0.2}Li_{0.05-1.2}Mg_{0.01}Ni_{0.8}O_{1.96}(PO₄)_{0.01}) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O	1.96	17778-80-2
O4P	0.01	14265-44-2
Ni	0.8	7440-02-0
Mg	0.01	7439-95-4
Li	0.05 - 1.2	7439-93-2
Al	0.2	7429-90-5

IC ICM H01M004-58

ICS H01M004-02; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST lithium **battery** carbon anode additive; alkali metal nickel
 oxide **battery** cathode; dendrite prevention
 lithium **battery** anode

IT **Battery** anodes**Battery** cathodes

(secondary Li **batteries** using carbon anodes and alkali
 metal nickel oxide **cathodes**)

IT 1344-28-1, Alumina, uses 7429-90-5, Aluminum, uses 7439-89-6,
 Iron, uses 7439-92-1, Lead, uses 7439-95-4, Magnesium, uses
 7440-02-0, Nickel, uses 7440-21-3, Silicon, uses 7440-22-4,
 Silver, uses 7440-31-5, Tin, uses 7440-42-8, Boron, uses
 7440-48-4, Cobalt, uses 7440-50-8, Copper, uses 7440-55-3,
 Gallium, uses 7440-74-6, Indium, uses 7704-34-9, Sulfur, uses
 7720-78-7, Iron sulfate (FeSO₄) 7723-14-0, Phosphorus, uses
 7782-49-2, Selenium, uses 10045-86-0, Iron phosphate (FePO₄)
 12035-57-3, Nickel silicide (NiSi) 12054-11-4 12059-14-2, Nickel
 silicide (Ni₂Si) 21651-19-4, Tin oxide (SnO) 22831-39-6,
 Magnesium silicide (Mg₂Si) 220179-34-0, Tin oxide silicide
 (SnO₂Si) 220179-35-1, Aluminum tin oxide (AlSnO₂) 220179-36-2,
 Tin boride oxide (SnBO₂)

(additive in carbon anodes; secondary Li **batteries**
 using carbon anodes and alkali metal nickel oxide
cathodes)

IT 7440-44-0, Carbon, uses

(**battery** anodes; secondary Li **batteries** using
 carbon anodes and alkali metal nickel oxide **cathodes**)

IT 220179-37-3, Cobalt lithium magnesium nickel oxide
 (Co_{0.3}Li_{0.05-1.2}Mg_{0.01}Ni_{0.7}O₂) 220179-38-4, Cobalt lithium
 nickel oxide phosphate (Co_{0.3}Li_{0.05-1.2}Ni_{0.7}O_{1.96}(PO₄)_{0.01})
 220179-39-5, Cobalt lithium magnesium nickel oxide

(Co_{0.2}Li_{0.05}-1.2Mg_{0.01}Ni_{0.802}) 220179-40-8, Cobalt lithium magnesium nickel oxide (Co_{0.1}Li_{0.05}-1.2Mg_{0.01}Ni_{0.902}) 220179-41-9, Cobalt lithium magnesium nickel oxide (Co_{0.1}Li_{0.05}-1.2Mg_{0.02}Ni_{0.902}) 220179-42-0, Cobalt lithium nickel oxide (Co_{0.1}Li_{0.05}-1.2Ni_{0.902}) 220179-44-2 220179-45-3, Lithium magnesium manganese nickel oxide (Li_{0.05}-1.2Mg_{0.01}Mn_{0.3}Ni_{0.702}) 220179-46-4, Lithium manganese nickel oxide phosphate (Li_{0.05}-1.2Mn_{0.3}Ni_{0.701.96}(PO₄)_{0.01}) 220179-47-5, Lithium magnesium manganese nickel oxide (Li_{0.05}-1.2Mg_{0.01}Mn_{0.2}Ni_{0.802}) 220179-48-6 220179-49-7, Lithium magnesium manganese nickel oxide (Li_{0.05}-1.2Mg_{0.01}Mn_{0.1}Ni_{0.902}) 220179-50-0, Lithium manganese nickel oxide (Li_{0.05}-1.2Mn_{0.1}Ni_{0.902}) 220179-51-1, Aluminum lithium magnesium nickel oxide (Al_{0.3}Li_{0.05}-1.2Mg_{0.01}Ni_{0.702}) 220179-52-2, Aluminum lithium nickel oxide phosphate (Al_{0.3}Li_{0.05}-1.2Ni_{0.701.96}(PO₄)_{0.01}) 220179-53-3, Aluminum lithium magnesium nickel oxide (Al_{0.2}Li_{0.05}-1.2Mg_{0.01}Ni_{0.802}) 220179-54-4 220179-55-5, Aluminum lithium magnesium nickel oxide (Al_{0.1}Li_{0.05}-1.2Mg_{0.01}Ni_{0.902}) 220179-56-6, Aluminum lithium nickel oxide (Al_{0.1}Li_{0.05}-1.2Ni_{0.902}) (cathodes; secondary Li batteries using carbon anodes and alkali metal nickel oxide cathodes)

L55 ANSWER 16 OF 19 HCA COPYRIGHT 2002 ACS

129:325267 Effects of Counterions in Heteropoly **Electrolyte**

Chemistry. 1. Evaluations of Relative Interactions by NMR on Kozik Salts. Kirby, James F.; Baker, Louis C. W. (Department of Chemistry, Georgetown University, Washington, DC, 20057, USA). Inorganic Chemistry, 37(21), 5537-5543 (English) 1998. CODEN: INOCAJ. ISSN: 0020-1669. Publisher: American Chemical Society.

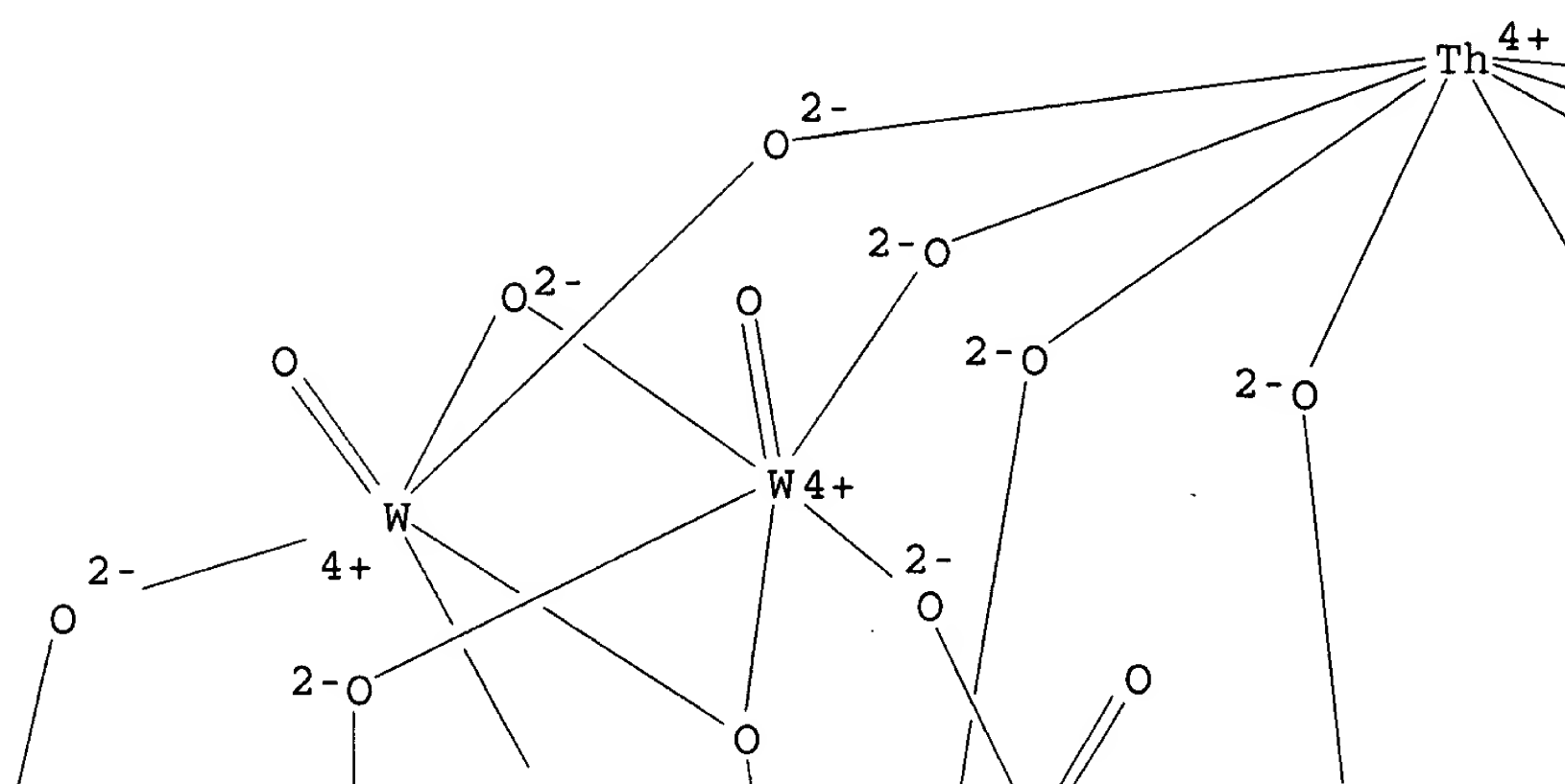
AB Evidence is accumulating for the major influence of the identities of counterions on syntheses and properties of various heteropoly anions. An easy and convenient NMR method is presented for evaluating the extent of significant assocn. between heteropoly tungstate species and monoat. metallic counterions (e.g., alkali metal cations). In diamagnetic [α -2-P2W17O61-Th4+- α -2-O61W17P2]¹⁶⁻, the Th linkage is a flexible **conducting** bridge between the two substituted Wells-Dawson entities. A Kozik complex is a heteropoly species contg. added delocalized blue electrons exchanging rapidly among several atoms (the belt W atoms of one Wells-Dawson unit in this case) while the same electrons exchange at a much slower rate through a **conducting** bridge. If a soln. of the parent oxidized complex is **reduced** by 2 electrons per anion, the added electron pairs are distributed among the Wells-Dawson entities present, yielding an equil. mixt. of oxidized, 4-electron-**reduced**, and 2-electron-**reduced** complexes. The ³¹P NMR spectrum of this mixt. consists, for each of the two structural types of P atoms, of three lines: one for each kind of complex. The signal for the 2-electron-**reduced** species, which contains a pair of electrons in one heteropoly entity and none in the other, is a coalesced exchange peak located between the other two signals. These Th complexes have anti and syn conformations. When large

IT 214786-29-5P

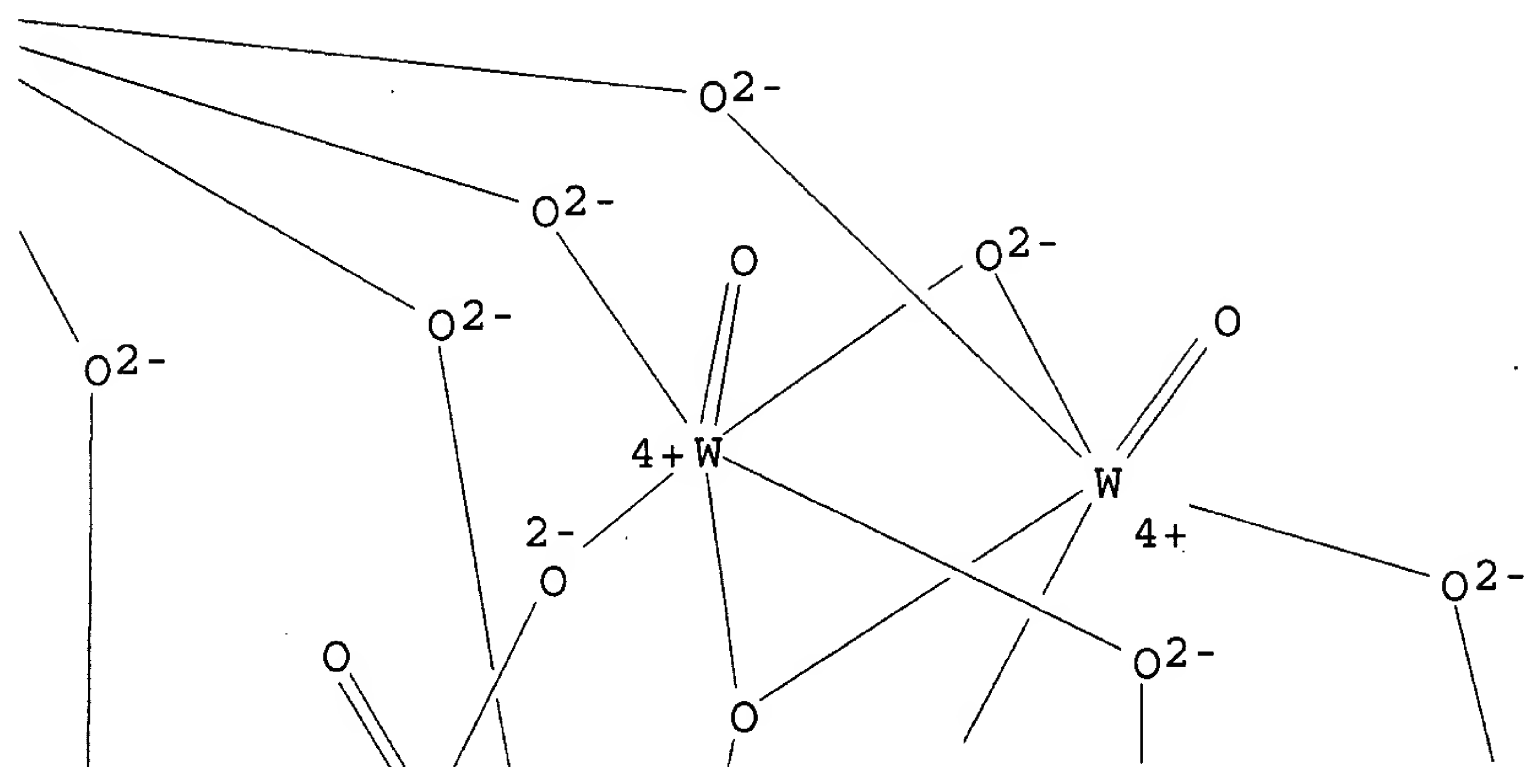
RN 214786-29-5 HCA

CN Thorate(16-), bis[dotriaconta-.mu.-oxoheptadeca-oxo[.mu.8-phosphato(3-)-.kappa.O:.kappa.O:.kappa.O':.kappa.O':.kappa.O'':.kappa.O'':.kappa.O''':.kappa.O''']][.mu.9-[phosphato(3-)-.kappa.O:.kappa.O:.kappa.O:.kappa.O':.kappa.O':.kappa.O'':.kappa.O'':.kappa.O''':.kappa.O''']]heptadecatungstate]octa-.mu.-oxo-, hexadecalithium (9CI) (CA INDEX NAME)

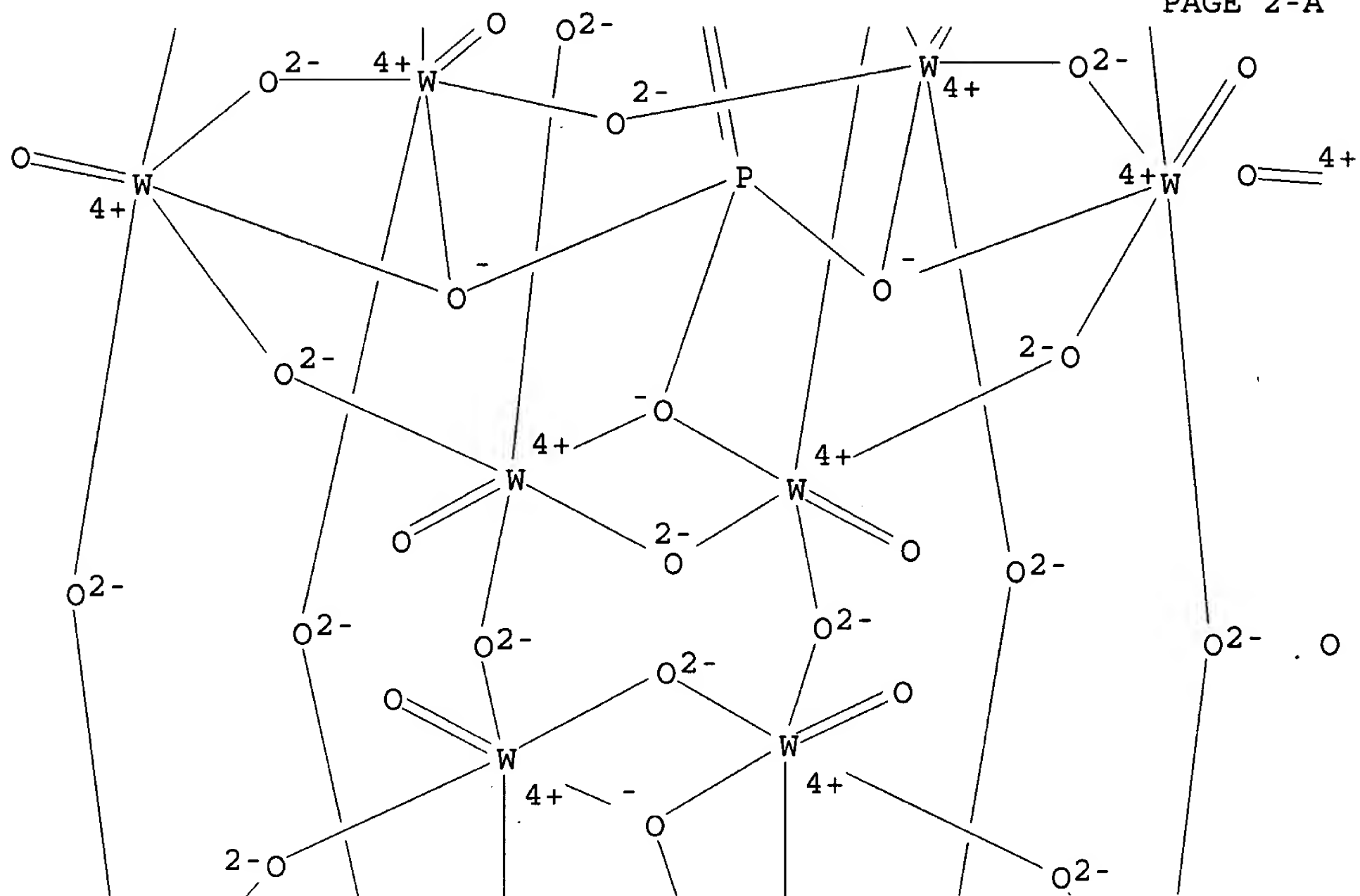
PAGE 1-A



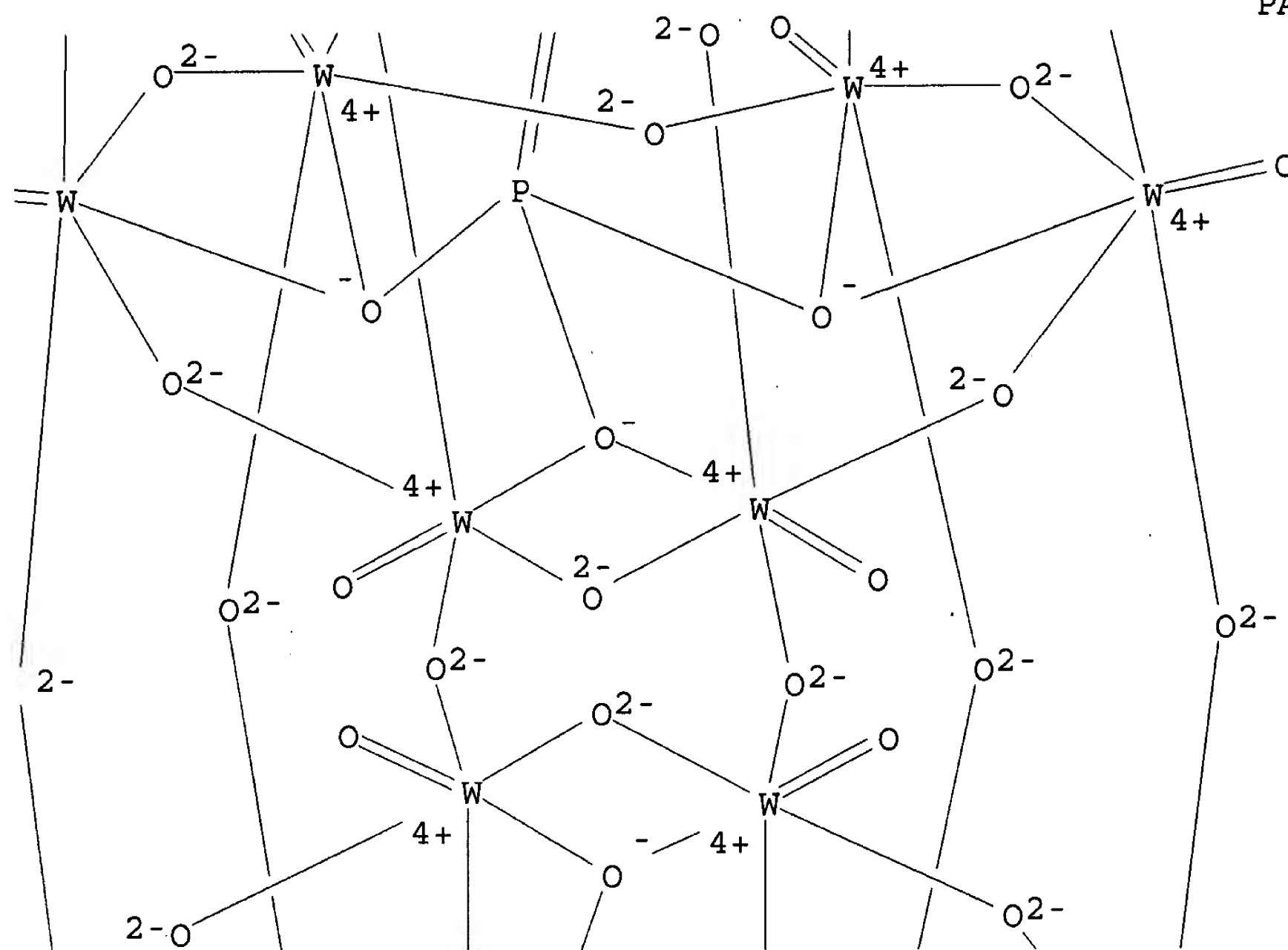
PAGE 1-B



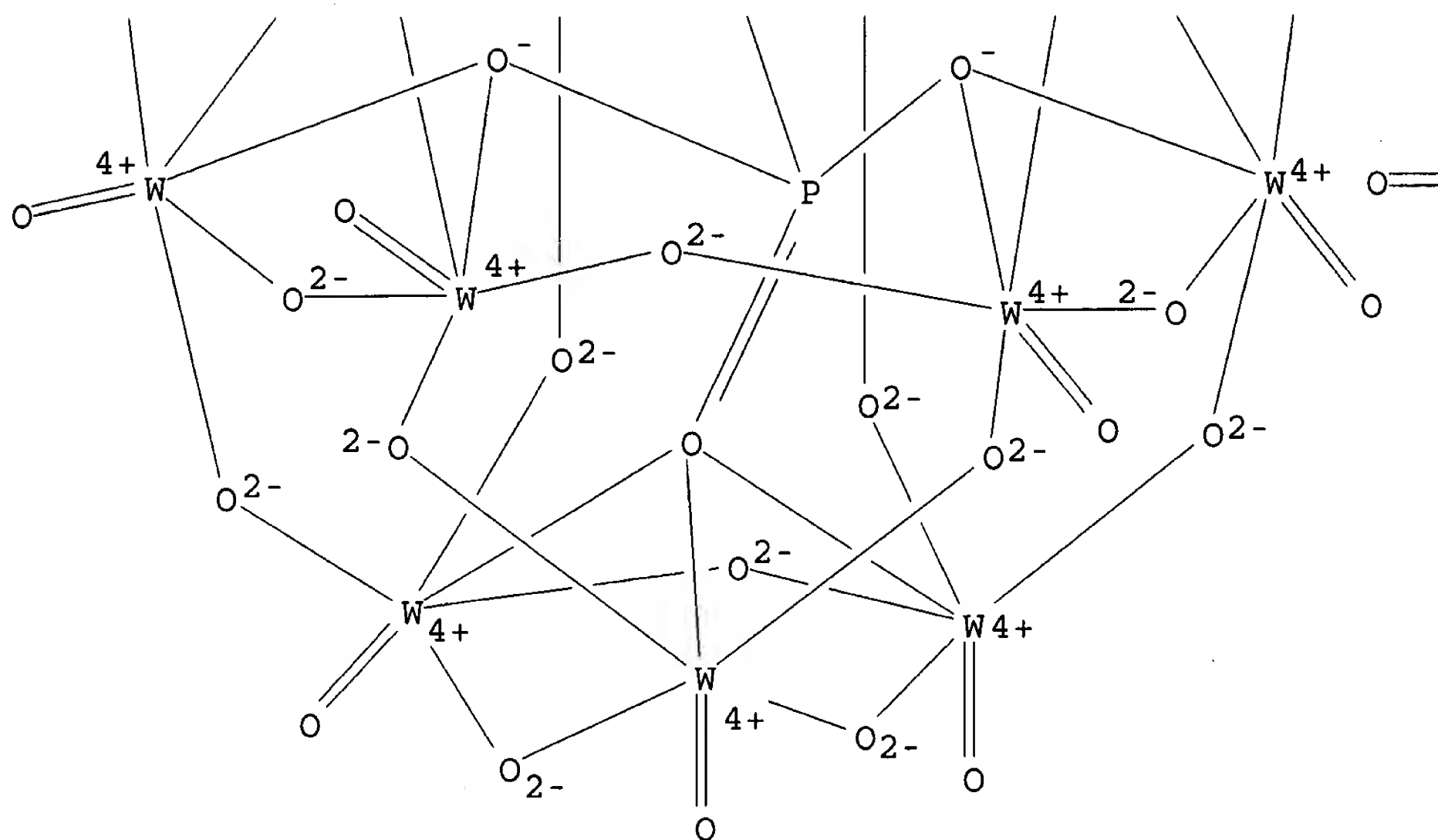
PAGE 2-A



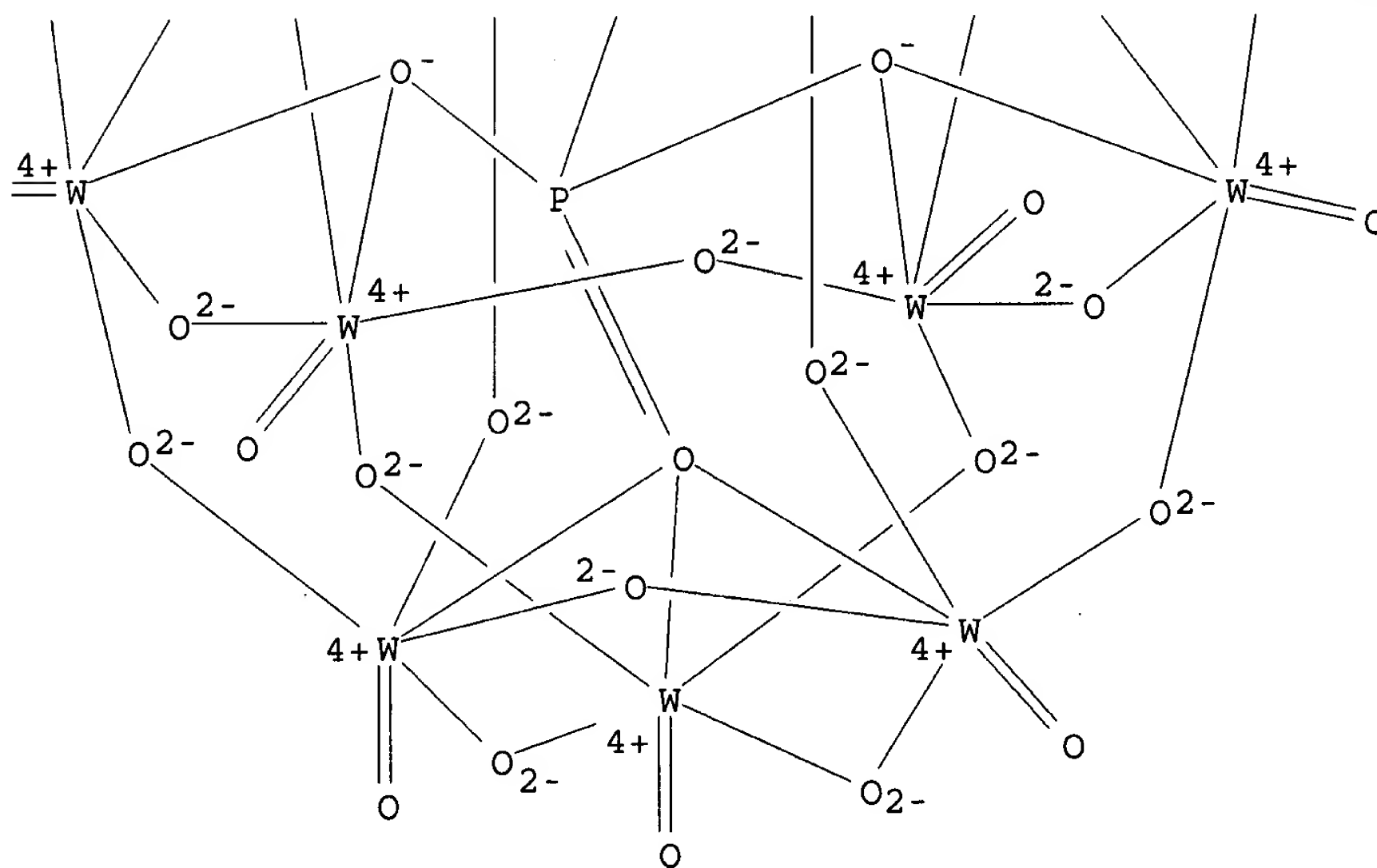
PAGE 2-B



PAGE 3-A



PAGE 3-B



CC 78-7 (Inorganic Chemicals and Reactions)
 Section cross-reference(s): 72, 77
 IT **Reduction**, electrochemical
 (for prepn. of Kozik salts)
 IT Heteropoly acids
 (tungstothorophosphates; prepn., **redn.** and substitution
 of lithium by alkali metal ions in Kozik salts as studied by NMR
 spectroscopy)
 IT **214786-29-5P**
 (prepn., **redn.** and substitution of lithium by alkali
 metal ions in Kozik salts as studied by NMR spectroscopy)

L55 ANSWER 17 OF 19 HCA COPYRIGHT 2002 ACS

128:5716 **Cathode** materials for secondary alkali metal-ion and
 lithium-ion **batteries**. Goodenough, John B.; Padhi,
 Akshaya; Nanjundaswamy, K. S.; Masquelier, Christian (Board of
 Regents, the University of Texas System, USA). PCT-Int. Appl. WO
9740541 A1 19971030, 47 pp. DESIGNATED STATES: W: CA, JP; RW: AT,
 BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE.
 (English). CODEN: PIXXD2. APPLICATION: WO 1997-US6671 19970423.
 PRIORITY: US 1996-16060 19960423; US 1996-32346 19961204.

AB The **cathode** materials are LiMPO_4 , where M is .gtoreq.1
 1st-row transition-metal cation; Mn, Fe, Co, and/or Ni; or $\text{Fe}_{1-x}\text{Mn}_x$
 or $\text{Fe}_{1-x}\text{Ti}_x$, where $0 < x < 1$. The **cathode** materials
 comprise a rhombohedral Nasicon material $\text{M}_1\text{xM}_2(\text{PO}_4)_3$, where M_1 is Li
 or Na and $x \leq 0.5$.

IT **198782-39-7**, Iron lithium phosphate ($\text{FeLi}_{0-1}(\text{PO}_4)$)
198782-41-1, Iron lithium phosphate ($\text{Fe}_2\text{Li}_{3-5}(\text{PO}_4)_3$)
 (**cathode** materials for secondary lithium-ion
batteries)

RN 198782-39-7 HCA

CN Iron lithium phosphate ($\text{FeLi}_{0-1}(\text{PO}_4)$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	1	14265-44-2
Li	0 - 1	7439-93-2
Fe	1	7439-89-6

RN 198782-41-1 HCA

CN Iron lithium phosphate ($\text{Fe}_2\text{Li}_{3-5}(\text{PO}_4)_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	3	14265-44-2
Li	3 - 5	7439-93-2
Fe	2	7439-89-6

IC ICM H01M004-58

ICS C01B025-26
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 49
 ST **cathode** material alkali metal ion **battery**;
 lithium ion **battery cathode** material; transition
 metal lithium phosphate **battery cathode**; Nasicon
 material alkali metal ion **battery**
 IT **Battery cathodes**
 (materials for secondary alkali metal-ion and lithium-ion)
 IT 36058-25-0P, Iron lithium phosphate ($\text{Fe}_2\text{Li}_3(\text{PO}_4)_3$) 184241-62-1P
 196612-05-2P, Iron lithium niobium phosphate ($\text{FeLiNb}(\text{PO}_4)_3$)
 198782-43-3P, Lithium vanadium phosphate ($\text{LiV}_2(\text{PO}_4)_3$)
 (**cathode** materials for secondary lithium-ion
batteries)
 IT 15365-14-7, Iron lithium phosphate (LiFePO_4) 196612-01-8, Lithium
 sodium vanadium phosphate ($\text{Li}_2\text{NaV}_2(\text{PO}_4)_3$) 198782-39-7,
 Iron lithium phosphate ($\text{FeLi}_{0-1}(\text{PO}_4)$) 198782-41-1, Iron
 lithium phosphate ($\text{Fe}_2\text{Li}_{3-5}(\text{PO}_4)_3$) 198782-42-2, Iron lithium
 phosphate sulfate ($\text{Fe}_2\text{Li}_{1-3}(\text{PO}_4)(\text{SO}_4)_2$)
 (**cathode** materials for secondary lithium-ion
batteries)
 IT 11123-44-7 59205-70-8 198782-44-4, Lithium niobium titanium
 phosphate ($\text{Li}_{0-2}\text{NbTi}(\text{PO}_4)_3$) 198782-45-5, Iron lithium niobium
 phosphate ($\text{FeLi}_{1-3}\text{Nb}(\text{PO}_4)_3$)
 (**cathode** materials for secondary lithium-ion
batteries)
 L55 ANSWER 18 OF 19 HCA COPYRIGHT 2002 ACS
 127:97562 **Cathode** active mass for lithium secondary
batteries and the **batteries**. Hikuma, Koichiro
 (Sony Corp., Japan). Jpn. Kokai Tokkyo Koho JP 09171827 A2 19970630
 Heisei, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP
 1995-350114 19951221.
 AB The **cathode** active mass is $\text{Li}_x\text{Fe}_2\text{PO}_4$ ($0 < x \leq 1.0$).
 The **batteries** show stable discharge voltage.
 IT 192194-49-3P, Iron lithium phosphate ($\text{Fe}_2\text{Li}(\text{PO}_4)$)
 192194-51-7P, Iron lithium phosphate ($\text{Fe}_2\text{Li}_{1-2}(\text{PO}_4)$)
 (**cathodes**; Fe Li phosphate **cathode** active
 mass for Li secondary **batteries**)
 RN 192194-49-3 HCA
 CN Iron lithium phosphate ($\text{Fe}_2\text{Li}(\text{PO}_4)$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	1	14265-44-2
Li	1	7439-93-2
Fe	2	7439-89-6

RN 192194-51-7 HCA
 CN Iron lithium phosphate ($\text{Fe}_2\text{Li}_{1-2}(\text{PO}_4)$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	1	14265-44-2
Li	1 - 2	7439-93-2
Fe	2	7439-89-6

IC ICM H01M004-58
ICS C01B025-45; H01M004-02; H01M010-40
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST lithium iron phosphate **cathode battery**
IT **Battery cathodes**
(Fe Li phosphate **cathode** active mass for Li secondary **batteries**)
IT 192194-49-3P, Iron lithium phosphate (Fe₂Li(PO₄))
192194-51-7P, Iron lithium phosphate (Fe₂Li₁₋₂(PO₄))
(**cathodes**; Fe Li phosphate **cathode** active mass for Li secondary **batteries**)

L55 ANSWER 19 OF 19 HCA COPYRIGHT 2002 ACS

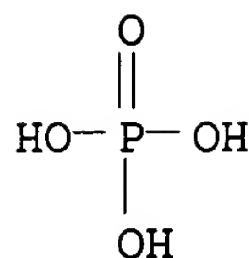
118:204178 A carbon dioxide gas sensor based on the lithium ionic **conductor**. Imanaka, Nobuhito (Fac. Eng., Osaka Univ., Suita, 565, Japan). Kenkyu Hokoku - Asahi Garasu Zaidan, 60, 91-7 (Japanese) 1992. CODEN: KHAZE2. ISSN: 0916-7064.

AB The prepn. and performance of the title sensor with Li₂CO₃ or Li₂CO₃-K₂CO₃-Na₂CO₃ (47.6:25.4:27.0) detecting electrode and CaCO₃ ref. electrode and using LiTi₂(PO₄)₃+0.2Li₃PO₄ solid **electrolyte** were reported. The response of the sensor (sample gas, Li₂CO₃/LiTi₂(PO₄)₃+0.2Li₃PO₄/CaCO₃) agreed well with the theor. emf. of the **galvanic cell** at the CO₂ concn. of 80 ppm-1% and at 650.degree.. The presence of NO₂ at 100-1500 ppm did not affect the value of emf., but of SO₂ at 20 ppm or over **reduced** the emf. at 650.degree.. The presence of the steam did not affect the value of emf. at 650.degree.. The sensor (sample gas, Li₂CO₃-K₂CO₃-Na₂CO₃/LiTi₂(PO₄)₃+0.2Li₃PO₄/CaCO₃) detected the CO₂ concn. of 100 ppm-1% even at 350.degree..

IT 30622-39-0
(solid **electrolyte** contg. lithium phosphate and, in prepn. of carbon dioxide gas sensor)

RN 30622-39-0 HCA

CN Phosphoric acid, lithium titanium(4+) salt (3:1:2) (8CI, 9CI) (CA INDEX NAME)



● 1/3 Li

● 2/3 Ti(IV)

- CC 79-2 (Inorganic Analytical Chemistry)
Section cross-reference(s): 72
- ST lithium ionic **conductor** carbon dioxide sensor; gas sensor
solid **electrolyte** carbon dioxide
- IT Sensors
(gas, electrochem., solid-state, lithium ionic **conductor**
-based, for carbon dioxide)
- IT 124-38-9, Carbon dioxide, analysis
(detn. of, lithium ionic **conductor**-based gas sensor
prepn. for)
- IT 30622-39-0
(solid **electrolyte** contg. lithium phosphate and, in
prepn. of carbon dioxide gas sensor)
- IT 10377-52-3, Lithium phosphate
(solid **electrolyte** contg. lithium titanium phosphate
and, in prepn. of carbon dioxide gas sensor)

=> d 156 1-15 cbib abs hitstr hitind

- L56 ANSWER 1 OF 15 HCA COPYRIGHT 2002 ACS
137:265592 secondary lithium **battery**. Fujita, Shigeru;
Akashi, Hiroyuki; Adachi, Momoe; Shibamoto, Goro (Sony Corp.,
Japan). Jpn. Kokai Tokkyo Koho JP 2002279989 A2 20020927, 13 pp.
(Japanese). CODEN: JKXXAF. APPLICATION: JP 2001-77086 20010316.
- AB The **battery** has a Li intercalating and depositing anode
and a oxide **cathode** active mass contg. Li, P and .gtoreq.1
of Fe, Mn and Co. The **cathode** may also contain a 2nd
oxide active mass contg. Li and .gtoreq.1 of Co, Ni, and Mn. The
anode active mass is selected from Li intercalating carbonaceous
materials and metals, semiconductors, alloys, and compds. capable of
alloying with Li.
- IT 213467-46-0, Iron lithium manganese phosphate
[FeLi₂Mn(PO₄)₂]

(compns. of oxide **cathodes** for secondary lithium
batteries with lithium intercalating and depositing
anodes)

RN 213467-46-0 HCA

CN Iron lithium manganese phosphate ($\text{FeLi}_2\text{Mn}(\text{PO}_4)_2$) (9CI) (CA INDEX
NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	2	14265-44-2
Mn	1	7439-96-5
Li	2	7439-93-2
Fe	1	7439-89-6

IC ICM H01M004-58

ICS H01M004-02; H01M004-38; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy
Technology)

ST secondary lithium **battery** mixed metal oxide
cathode; phosphorus metal oxide **cathode** compn
secondary **battery**

IT **Battery cathodes**

(compns. of oxide **cathodes** for secondary lithium
batteries with lithium intercalating and depositing
anodes)

IT **Battery anodes**

(lithium intercalating and depositing anodes for secondary
lithium **batteries** with oxide **cathodes**)

IT Carbonaceous materials (technological products)

(lithium intercalating and depositing anodes for secondary
lithium **batteries** with oxide **cathodes**)

IT Secondary **batteries**

(lithium; secondary lithium **batteries** with oxide
cathodes and lithium intercalating and depositing anodes)

IT 12057-17-9, Lithium manganese oxide (LiMn_2O_4) 12190-79-3, Cobalt
lithium oxide (CoLiO_2) 15365-14-7, Iron lithium phosphate
(FeLiPO_4) 113066-89-0, Cobalt lithium nickel oxide
($\text{Co}_{0.2}\text{LiNi}_{0.8}\text{O}_2$) 213467-46-0, Iron lithium manganese
phosphate [$\text{FeLi}_2\text{Mn}(\text{PO}_4)_2$]

(compns. of oxide **cathodes** for secondary lithium
batteries with lithium intercalating and depositing
anodes)

IT 7429-90-5, Aluminum, uses 7439-92-1, Lead, uses 7439-95-4,
Magnesium, uses 7440-21-3, Silicon, uses 7440-22-4, Silver, uses
7440-31-5, Tin, uses 7440-36-0, Antimony, uses 7440-38-2,
Arsenic, uses 7440-42-8, Boron, uses 7440-43-9, Cadmium, uses
7440-55-3, Gallium, uses 7440-56-4, Germanium, uses 7440-58-6,
Hafnium, uses 7440-65-5, Yttrium, uses 7440-66-6, Zinc, uses
7440-67-7, Zirconium, uses 7440-69-9, Bismuth, uses 7440-74-6,
Indium, uses 7782-42-5, Graphite, uses
(lithium intercalating and depositing anodes for secondary

lithium **batteries** with oxide **cathodes**)

L56 ANSWER 2 OF 15 HCA COPYRIGHT 2002 ACS

137:219425 7Li and 31P magic angle spinning nuclear magnetic resonance of LiFePO₄-type materials. Tucker, Michael C.; Doeff, Marca M.; Richardson, Thomas J.; Finones, Rita; Reimer, Jeffrey A.; Cairns, Elton J. (Energy and Environmental Technologies Division, Ernest Orlando Lawrence Berkeley National Laboratory and Department of Chemical Engineering, University of California Berkeley, Berkeley, CA, 94720, USA). Electrochemical and Solid-State Letters, 5(5), A95-A98 (English) 2002. CODEN: ESLEF6. ISSN: 1099-0062. Publisher: Electrochemical Society.

AB LiFePO₄ and LiMnPO₄ were characterized using 7Li and 31P magic angle spinning (MAS) NMR spectroscopy. LiFePO₄ was synthesized by a hydrothermal route and LiMnPO₄ was synthesized at high temp. in an inert atm. Both compns. give rise to single isotropic 7Li resonances. The MAS isotropic peak linewidth for LiFePO₄ is considerably larger than that for LiMnPO₄, suggesting the presence of local disorder in the Li coordination sphere for LiFePO₄. In both samples, the isotropic peak is accompanied by a large, asym. spinning sideband manifold, arising from bulk magnetic susceptibility broadening and the paramagnetic interaction between the lithium nucleus and transition metal unpaired electrons.

IT 19414-36-9, Iron lithium manganese phosphate ((Fe,Mn)Li(PO₄))

(Li and 31P magic angle spinning NMR of LiFePO₄-type materials)

RN 19414-36-9 HCA

CN Iron lithium manganese phosphate ((Fe,Mn)Li(PO₄)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	1	14265-44-2
Mn	0 - 1	7439-96-5
Li	1	7439-93-2
Fe	0 - 1	7439-89-6

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

Section cross-reference(s): 67, 77

ST magic angle spinning NMR lithium phosphorus phosphate **battery cathode**; secondary **battery cathode** lithium iron magnesium phosphate magnetic susceptibility

IT **Battery cathodes**

MAS NMR spectroscopy

Magnetic susceptibility

Paramagnetic centers

Solid state secondary **batteries**

(Li and 31P magic angle spinning NMR of LiFePO₄-type materials)

IT 19414-36-9, Iron lithium manganese phosphate

((Fe,Mn)Li(PO₄))

(Li and ³¹P magic angle spinning NMR of LiFePO₄-type materials)

L56 ANSWER 3 OF 15 HCA COPYRIGHT 2002 ACS

137:35475 **Nonaqueous electrolyte battery.**

Goto, Shuji (Sony Corp., Japan). Jpn. Kokai Tokkyo Koho JP 2002170567 A2 20020614, 9 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2000-369000 20001204.

AB The **battery** has a coiled stack contg. a separator between an anode and a **cathode** in a laminated film package, where the **cathode** is Li_xFe_{1-y}M_yPO₄ (0.05 ≤ x ≤ 1.2, y ≤ 0.8, M = Mn, Cr, Co, Cu, Ni, Y, Mo, Ti, Zr, Al, Ga, Mg, b, and/or Nb). The **cathode** may also contain other active mass having lower discharge potential than the phosphate.

IT **412351-36-1**, Iron lithium manganese phosphate (Fe_{0.9}LiMn_{0.1}(PO₄))

(compns. of substituted iron lithium phosphate **cathodes** for secondary lithium **batteries**)

RN 412351-36-1 HCA

CN Iron lithium manganese phosphate (Fe_{0.9}LiMn_{0.1}(PO₄)) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	1	14265-44-2
Mn	0.1	7439-96-5
Li	1	7439-93-2
Fe	0.9	7439-89-6

IC ICM H01M004-58

ICS H01M004-02; H01M010-40

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)

ST **battery cathode** substituted lithium iron phosphate

IT **Battery cathodes**

(compns. of substituted iron lithium phosphate **cathodes** for secondary lithium **batteries**)

IT 12031-65-1, Lithium nickel oxide (LiNiO₂) 12057-17-9, Lithium manganese oxide (LiMn₂O₄) 12190-79-3, Cobalt lithium oxide (CoLiO₂) 15365-14-7, Iron lithium phosphate (FeLiPO₄) 116327-69-6, Cobalt lithium nickel oxide (Co_{0.1}LiNi_{0.9}O₂) 147812-18-8, Iron lithium manganese oxide (Fe_{0.05}LiMn_{1.95}O₄) 408332-58-1, Aluminum cobalt lithium nickel oxide (Al_{0.01}Co_{0.98}LiNi_{0.01}O₂) **412351-36-1**, Iron lithium manganese phosphate (Fe_{0.9}LiMn_{0.1}(PO₄)) (compns. of substituted iron lithium phosphate **cathodes** for secondary lithium **batteries**)

L56 ANSWER 4 OF 15 HCA COPYRIGHT 2002 ACS

136:357523 **Cathode** active mass and **batt ry** using the

active mass. Li, Guohua (Sony Corporation, Japan). PCT Int. Appl. WO 2002039523 A1 20020516, 28 pp. DESIGNATED STATES: W: CA, CN, KR, MX, US; RW: DE, FI, FR, GB, SE. (Japanese). CODEN: PIXXD2. APPLICATION: WO 2001-JP9747 20011107. PRIORITY: JP 2000-342410 20001109.

AB The **cathode** active mass contains $\text{Li}_{1+x}\text{Mn}_y\text{Fe}_z\text{PO}_4$ ($0 < x < 0.1$, $0.5 < y < 0.95$, $0.9 < (y+z) \leq 1$). The **battery** is a secondary Li **battery**.

IT **421766-60-1**, Iron lithium manganese phosphate ($\text{Fe}_{0.05}\text{Li}_{1-1.1}\text{Mn}_{0.5-0.95}(\text{PO}_4)$) **421766-61-2**, Iron lithium manganese phosphate ($\text{Fe}_{0.27}\text{Li}_{1.03}\text{Mn}_{0.7}(\text{PO}_4)$) **421766-62-3**, Iron lithium manganese phosphate ($\text{Fe}_{0.25}\text{Li}_{1.05}\text{Mn}_{0.7}(\text{PO}_4)$) **421766-63-4**, Iron lithium manganese phosphate ($\text{Fe}_{0.22}\text{Li}_{1.03}\text{Mn}_{0.75}(\text{PO}_4)$) **421766-64-5**, Iron lithium manganese phosphate ($\text{Fe}_{0.2}\text{Li}_{1.05}\text{Mn}_{0.75}(\text{PO}_4)$) **421766-65-6**, Iron lithium manganese phosphate ($\text{Fe}_{0.25}\text{Li}_{1.03}\text{Mn}_{0.75}(\text{PO}_4)$) (compns. of lithium iron manganese phosphate active mass for secondary lithium **batteries**)

RN 421766-60-1 HCA

CN Iron lithium manganese phosphate ($\text{Fe}_{0.05}\text{Li}_{1-1.1}\text{Mn}_{0.5-0.95}(\text{PO}_4)$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	1	14265-44-2
Mn	0.5 - 0.95	7439-96-5
Li	1 - 1.1	7439-93-2
Fe	0.05 - 0.5	7439-89-6

RN 421766-61-2 HCA

CN Iron lithium manganese phosphate ($\text{Fe}_{0.27}\text{Li}_{1.03}\text{Mn}_{0.7}(\text{PO}_4)$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	1	14265-44-2
Mn	0.7	7439-96-5
Li	1.03	7439-93-2
Fe	0.27	7439-89-6

RN 421766-62-3 HCA

CN Iron lithium manganese phosphate ($\text{Fe}_{0.25}\text{Li}_{1.05}\text{Mn}_{0.7}(\text{PO}_4)$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	1	14265-44-2
Mn	0.7	7439-96-5

Li	1.05	7439-93-2
Fe	0.25	7439-89-6

RN 421766-63-4 HCA

CN Iron lithium manganese phosphate ($\text{Fe}_{0.22}\text{Li}_{1.03}\text{Mn}_{0.75}(\text{PO}_4)$) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	1	14265-44-2
Mn	0.75	7439-96-5
Li	1.03	7439-93-2
Fe	0.22	7439-89-6

RN 421766-64-5 HCA

CN Iron lithium manganese phosphate ($\text{Fe}_{0.2}\text{Li}_{1.05}\text{Mn}_{0.75}(\text{PO}_4)$) (9CI) (CA
INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	1	14265-44-2
Mn	0.75	7439-96-5
Li	1.05	7439-93-2
Fe	0.2	7439-89-6

RN 421766-65-6 HCA

CN Iron lithium manganese phosphate ($\text{Fe}_{0.25}\text{Li}_{1.03}\text{Mn}_{0.75}(\text{PO}_4)$) (9CI)
(CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	1	14265-44-2
Mn	0.75	7439-96-5
Li	1.03	7439-93-2
Fe	0.25	7439-89-6

IC ICM H01M004-58

ICS H01M004-02; H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy
Technology)ST secondary **battery cathode** lithium manganese iron
phosphateIT **Battery cathodes**(compns. of lithium iron manganese phosphate active mass for
secondary lithium **batteries**)IT 421766-60-1, Iron lithium manganese phosphate
($\text{Fe}_{0.05-0.5}\text{Li}_{1-1.1}\text{Mn}_{0.5-0.95}(\text{PO}_4)$) 421766-61-2, Iron
lithium manganese phosphate ($\text{Fe}_{0.27}\text{Li}_{1.03}\text{Mn}_{0.7}(\text{PO}_4)$)
421766-62-3, Iron lithium manganese phosphate

(Fe_{0.25}Li_{1.05}Mn_{0.7}(PO₄)) **421766-63-4**, Iron lithium
 manganese phosphate (Fe_{0.22}Li_{1.03}Mn_{0.75}(PO₄)) **421766-64-5**,
 Iron lithium manganese phosphate (Fe_{0.2}Li_{1.05}Mn_{0.75}(PO₄))
421766-65-6, Iron lithium manganese phosphate
 (Fe_{0.25}Li_{1.03}Mn_{0.75}(PO₄))
 (compns. of lithium iron manganese phosphate active mass for
 secondary lithium **batteries**)

L56 ANSWER 5 OF 15 HCA COPYRIGHT 2002 ACS

136:328121 Lithium-iron complex oxide for active mix of lithium
 secondary **battery positive electrode**.

Kanzaki, Masao; Takeuchi, Youji; Ukyo, Yoshio (Toyota Central
 Research and Development Laboratories, Inc., Japan). Jpn. Kokai
 Tokkyo Koho JP 2002117845 A2 20020419, 8 pp. (Japanese). CODEN:
 JKXXAF. APPLICATION: JP 2000-307685 20001006.

AB Lithium-iron complex oxide for active mix of lithium secondary
battery pos. electrode is LiFe_{1-x}M_xPO₄
 (M = Mn, Mg, Ni, Co; x = 0.02-0.2) with olivine crystal structure.
 The active mix preferably has a particle size of .ltoreq.1 .mu.m.
 The **battery** has a large discharge capacity of active mix
 and good cycle life.

IT **412351-36-1**, Iron lithium manganese phosphate
 (Fe_{0.9}LiMn_{0.1}(PO₄))
 (lithium-iron complex oxide for active mix of lithium secondary
battery pos. electrode)

RN 412351-36-1 HCA

CN Iron lithium manganese phosphate (Fe_{0.9}LiMn_{0.1}(PO₄)) (9CI) (CA
 INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	1	14265-44-2
Mn	0.1	7439-96-5
Li	1	7439-93-2
Fe	0.9	7439-89-6

IC ICM H01M004-58

ICS C01G049-00; H01M004-02; H01M010-40

CC **52-2** (Electrochemical, Radiational, and Thermal Energy
 Technology)

ST lithium iron complex oxide secondary **battery**

IT **Battery cathodes**

(lithium-iron complex oxide for active mix of lithium secondary
battery pos. electrode)

IT Olivine-group minerals

(lithium-iron complex oxide for active mix of lithium secondary
battery pos. electrode)

IT **412351-36-1**, Iron lithium manganese phosphate
 (Fe_{0.9}LiMn_{0.1}(PO₄))

(lithium-iron complex oxide for active mix of lithium secondary
battery pos. electrode)

L56 ANSWER 6 OF 15 HCA COPYRIGHT 2002 ACS

136:297401 **Nonaqueous electrolyte battery**

with high discharge capacity. Sakai, Hidecki; Fukushima, Yuzuru; Kuyama, Junji; Hosoya, Mamoru (Sony Corporation, Japan). Eur. Pat. Appl. EP 1195838 A2 20020410, 17 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-123895 20011005. PRIORITY: JP 2000-308303 20001006.

AB A **nonaq. electrolyte cell** is disclosed having high discharge capacity, an improved capacity upkeep ratio and optimum cyclic characteristics. The **nonaq. electrolyte cell** has a cell device including a strip-shaped **cathode** material and a strip-shaped anode material, layered and together via a separator and coiled a plural no. of times, a **nonaq. electrolyte soln.**, and a cell can for accommodating cell device and the **nonaq. electrolyte soln.** The **cathode** employs a **cathode** active material contg. a compd. of the olivinic structure represented by the general formula $\text{Li}_x\text{Fe}_{1-y}\text{M}_y\text{PO}_4$, where M is at least one selected from the group consisting of Mn, Cr, Co, Cu, Ni, V, Mo, Ti, Zn, Al, Ga, Mg, B and Nb, with $0.05 \leq x \leq 1.2$ and $0 \leq y \leq 0.8$, with the compd. being used either singly or in combination with other materials. The ratio of an inner diam. d to an outer diam. D of cell device is selected so that $0.05 < d/D < 0.5$.

IT **407606-34-2**, Iron lithium manganese phosphate ($\text{Fe}_{0.2}\text{-1Li}_{0.05}\text{-1.2Mn}_{0.8}(\text{PO}_4)$)

(**nonaq. electrolyte battery** with high discharge capacity)

RN 407606-34-2 HCA

CN Iron lithium manganese phosphate ($\text{Fe}_{0.2}\text{-1Li}_{0.05}\text{-1.2Mn}_{0.8}(\text{PO}_4)$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	1	14265-44-2
Mn	0 - 0.8	7439-96-5
Li	0.05 - 1.2	7439-93-2
Fe	0.2 - 1	7439-89-6

IC ICM H01M010-40

ICS H01M004-58

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)

ST **battery nonaq electrolyte high** discharge capacity

IT Secondary **batteries** (lithium; **nonaq. electrolyte battery** with high discharge capacity)

IT **Battery cathodes**

- (**nonaq. electrolyte battery** with high discharge capacity)
- IT Carbon black, uses
(**nonaq. electrolyte battery** with high discharge capacity)
- IT Lithium alloy, base
(**nonaq. electrolyte battery** with high discharge capacity)
- IT 7439-93-2, Lithium, uses 15365-14-7, Iron lithium phosphate
felipo4 407606-22-8, Chromium iron lithium phosphate
(Cr0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-24-0, Cobalt iron lithium
phosphate (Co0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-26-2, Copper iron
lithium phosphate (Cu0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-28-4,
Aluminum iron lithium phosphate (Al0-0.8Fe0.2-1Li0.05-1.2(PO4))
407606-30-8, Gallium iron lithium phosphate (Ga0-0.8Fe0.2-1Li0.05-
1.2(PO4)) 407606-32-0, Boron iron lithium phosphate
(B0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-34-2, Iron lithium
manganese phosphate (Fe0.2-1Li0.05-1.2Mn0-0.8(PO4)) 407606-36-4,
Iron lithium nickel phosphate (Fe0.2-1Li0.05-1.2Ni0-0.8(PO4))
407606-39-7, Iron lithium vanadium phosphate (Fe0.2-1Li0.05-1.2V0-
0.8(PO4)) 407606-42-2, Iron lithium molybdenum phosphate
(Fe0.2-1Li0.05-1.2Mo0-0.8(PO4)) 407606-44-4, Iron lithium titanium
phosphate (Fe0.2-1Li0.05-1.2Ti0-0.8(PO4)) 407606-47-7, Iron
lithium zinc phosphate (Fe0.2-1Li0.05-1.2Zn0-0.8(PO4))
407606-49-9, Iron lithium magnesium phosphate (Fe0.2-1Li0.05-1.2Mg0-
0.8(PO4)) 407606-51-3, Iron lithium niobium phosphate
(Fe0.2-1Li0.05-1.2Nb0-0.8(PO4)) 407629-83-8 407629-87-2
407629-90-7 407629-95-2 407630-01-7 407630-05-1 407630-10-8
407630-14-2 407630-25-5, Aluminum iron lithium phosphate
(Al0.7Fe0.3Li(PO4)) 407630-29-9, Gallium iron lithium phosphate
(Ga0.7Fe0.3Li(PO4)) 407630-35-7 407630-40-4, Boron iron lithium
phosphate (B0.75Fe0.25Li(PO4)) 408501-54-2
(**nonaq. electrolyte battery** with high discharge capacity)

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136:297400 **Nonaqueous electrolyte** secondary

battery using olivinic lithium phosphorus oxide

cathode active material. Okawa, Tsuyoshi; Hosoya, Mamoru;

Kuyama, Junji; Fukushima, Yuzuru (Sony Corporation, Japan). Eur.

Pat. Appl. EP 1195837 A2 20020410, 15 pp. DESIGNATED STATES: R:

AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE,

SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP

2001-123893 20011005. PRIORITY: JP 2000-308302 20001006.

- AB In a **battery**, liq. leakage or destruction may be prevented
as the apparent energy d. per unit vol. of the cell is maintained.
The cell uses, as a **cathode** active material, a compd. of
an olivinic crystal structure having the formula $\text{Li}_x\text{Fe}_1\text{-xMyPO}_4$,
where M is at least one selected from the group of Mn, Cr, Co, Cu,
Ni, V, Mo, Ti, Zn, Al, Ga, Mg, B and Nb and 0.05 .ltoreq. x .ltoreq.
1.2 and 0 .ltoreq. y .ltoreq. 0.8. By adjusting the amt. of the
electrolyte soln., the amt. of the void in the container is

set so as to be not less than 0.14 mL and not more than 3.3 mL per 1 Ah of the cell capacity.

IT 407606-34-2, Iron lithium manganese phosphate
(Fe_{0.2}-1Li_{0.05}-1.2Mn_{0.8}(PO₄))
(**nonaq. electrolyte secondary battery**
using olivinic lithium phosphorus oxide **cathode** active
material)
RN 407606-34-2 HCA
CN Iron lithium manganese phosphate (Fe_{0.2}-1Li_{0.05}-1.2Mn_{0.8}(PO₄))
(9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	1	14265-44-2
Mn	0 - 0.8	7439-96-5
Li	0.05 - 1.2	7439-93-2
Fe	0.2 - 1	7439-89-6

IC ICM H01M010-40
ICS H01M004-58
CC 52-2 (Electrochemical, Radiational, and Thermal Energy
Technology)
ST **battery** olivinic lithium phosphorus oxide **cathode**
; **nonaq electrolyte** lithium secondary
battery
IT Secondary **batteries**
(lithium; **nonaq. electrolyte** secondary
battery using olivinic lithium phosphorus oxide
cathode active material)
IT **Battery cathodes**
Composites
(**nonaq. electrolyte** secondary **battery**
using olivinic lithium phosphorus oxide **cathode** active
material)
IT Coke
(pitch; **nonaq. electrolyte** secondary
battery using olivinic lithium phosphorus oxide
cathode active material)
IT 108-32-7, Propylene carbonate 616-38-6, Dimethyl carbonate
7440-44-0, Carbon, uses 15365-14-7, Iron lithium phosphate felipo4
21324-40-3, Lithium hexafluorophosphate 407606-22-8, Chromium iron
lithium phosphate (Cr_{0.8}Fe_{0.2}-1Li_{0.05}-1.2(PO₄)) 407606-24-0,
Cobalt iron lithium phosphate (Co_{0.8}Fe_{0.2}-1Li_{0.05}-1.2(PO₄))
407606-26-2, Copper iron lithium phosphate (Cu_{0.8}Fe_{0.2}-1Li_{0.05}-
1.2(PO₄)) 407606-28-4, Aluminum iron lithium phosphate
(Al_{0.8}Fe_{0.2}-1Li_{0.05}-1.2(PO₄)) 407606-30-8, Gallium iron lithium
phosphate (Ga_{0.8}Fe_{0.2}-1Li_{0.05}-1.2(PO₄)) 407606-32-0, Boron iron
lithium phosphate (B_{0.8}Fe_{0.2}-1Li_{0.05}-1.2(PO₄)) **407606-34-2**
, Iron lithium manganese phosphate (Fe_{0.2}-1Li_{0.05}-1.2Mn_{0.8}(PO₄))
407606-36-4, Iron lithium nickel phosphate (Fe_{0.2}-1Li_{0.05}-1.2Ni_{0.8}-
0.8(PO₄)) 407606-39-7, Iron lithium vanadium phosphate

(Fe_{0.2}-1Li_{0.05}-1.2V₀-0.8(PO₄)) 407606-42-2, Iron lithium molybdenum phosphate (Fe_{0.2}-1Li_{0.05}-1.2Mo₀-0.8(PO₄)) 407606-44-4, Iron lithium titanium phosphate (Fe_{0.2}-1Li_{0.05}-1.2Ti₀-0.8(PO₄)) 407606-47-7, Iron lithium zinc phosphate (Fe_{0.2}-1Li_{0.05}-1.2Zn₀-0.8(PO₄)) 407606-49-9, Iron lithium magnesium phosphate (Fe_{0.2}-1Li_{0.05}-1.2Mg₀-0.8(PO₄)) 407606-51-3, Iron lithium niobium phosphate (Fe_{0.2}-1Li_{0.05}-1.2Nb₀-0.8(PO₄)) 407629-83-8 407629-87-2 407629-90-7 407629-95-2 407630-01-7 407630-05-1 407630-10-8 407630-14-2 407630-19-7 407630-25-5, Aluminum iron lithium phosphate (Al_{0.7}Fe_{0.3}Li(PO₄)) 407630-29-9, Gallium iron lithium phosphate (Ga_{0.7}Fe_{0.3}Li(PO₄)) 407630-35-7 - 407630-40-4, Boron iron lithium phosphate (B_{0.75}Fe_{0.25}Li(PO₄)) 407630-46-0
(nonaq. electrolyte secondary battery
 using olivinic lithium phosphorus oxide **cathode** active material)

L56 ANSWER 8 OF 15 HCA COPYRIGHT 2002 ACS

136:297398 **Cathode** and anode materials for solid

nonaqueous electrolyte battery.

Takahashi, Kimio; Hosoya, Mamoru; Miyake, Masami (Sony Corporation, Japan). Eur. Pat. Appl. EP 1195835 A2 20020410, 22 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-123773 20011004. PRIORITY: JP 2000-306877 20001005.

AB A **battery** is not deteriorated in cell characteristics and maintains the cell shape encapsulated in a laminate film even when overdischarged to a cell voltage of 0 V. The cell includes a **cathode** contg. a compd. having the formula Li_xFe_{1-y}MyPO₄, where M is at least one selected from the group consisting of Mn, Cr, Co, Cu, Ni, V, Mo, Ti, Zn, Al, Ga, Mg, B and Nb, with 0.05 .ltoreq. x .ltoreq. 1.2 and 0 .ltoreq. y .ltoreq. 0.8, an anode and a solid **electrolyte**. A cell member comprised of the **cathode** and the anode, layered together with the interposition of a solid **electrolyte**, is encapsulated in a laminate film.

IT 407606-34-2, Iron lithium manganese phosphate (Fe_{0.2}-1Li_{0.05}-1.2Mn₀-0.8(PO₄))
(cathode and anode materials for solid nonaq. electrolyte battery)

RN 407606-34-2 HCA

CN Iron lithium manganese phosphate (Fe_{0.2}-1Li_{0.05}-1.2Mn₀-0.8(PO₄))
 (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	1	14265-44-2
Mn	0 - 0.8	7439-96-5
Li	0.05 - 1.2	7439-93-2
Fe	0.2 - 1	7439-89-6

- IC ICM H01M010-40
ICS H01M004-58
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST **battery solid nonaq electrolyte cathode anode material**
- IT **Battery anodes**
Battery cathodes
Battery electrolytes
(**cathode and anode materials for solid nonaq. electrolyte battery**)
- IT 7440-44-0, Carbon, uses 15365-14-7, Iron lithium phosphate FeLiPO_4 407606-22-8, Chromium iron lithium phosphate ($\text{Cr}_{0.2}\text{Fe}_{0.8}\text{Li}_{1.2}\text{PO}_4$) 407606-24-0, Cobalt iron lithium phosphate ($\text{Co}_{0.2}\text{Fe}_{0.8}\text{Li}_{1.2}\text{PO}_4$) 407606-26-2, Copper iron lithium phosphate ($\text{Cu}_{0.2}\text{Fe}_{0.8}\text{Li}_{1.2}\text{PO}_4$) 407606-28-4, Aluminum iron lithium phosphate ($\text{Al}_{0.2}\text{Fe}_{0.8}\text{Li}_{1.2}\text{PO}_4$) 407606-30-8, Gallium iron lithium phosphate ($\text{Ga}_{0.2}\text{Fe}_{0.8}\text{Li}_{1.2}\text{PO}_4$) 407606-32-0, Boron iron lithium phosphate ($\text{B}_{0.2}\text{Fe}_{0.8}\text{Li}_{1.2}\text{PO}_4$) **407606-34-2**, Iron lithium manganese phosphate ($\text{Fe}_{0.2}\text{Li}_{1.2}\text{Mn}_{0.8}\text{PO}_4$) 407606-36-4, Iron lithium nickel phosphate ($\text{Fe}_{0.2}\text{Li}_{1.2}\text{Ni}_{0.8}\text{PO}_4$) 407606-39-7, Iron lithium vanadium phosphate ($\text{Fe}_{0.2}\text{Li}_{1.2}\text{V}_{0.8}\text{PO}_4$) 407606-42-2, Iron lithium molybdenum phosphate ($\text{Fe}_{0.2}\text{Li}_{1.2}\text{Mo}_{0.8}\text{PO}_4$) 407606-44-4, Iron lithium titanium phosphate ($\text{Fe}_{0.2}\text{Li}_{1.2}\text{Ti}_{0.8}\text{PO}_4$) 407606-47-7, Iron lithium zinc phosphate ($\text{Fe}_{0.2}\text{Li}_{1.2}\text{Zn}_{0.8}\text{PO}_4$) 407606-49-9, Iron lithium magnesium phosphate ($\text{Fe}_{0.2}\text{Li}_{1.2}\text{Mg}_{0.8}\text{PO}_4$) 407606-51-3, Iron lithium niobium phosphate ($\text{Fe}_{0.2}\text{Li}_{1.2}\text{Nb}_{0.8}\text{PO}_4$)
(**cathode and anode materials for solid nonaq. electrolyte battery**)
- IT 7439-93-2, Lithium, uses
(**cathode and anode materials for solid nonaq. electrolyte battery**)

L56 ANSWER 9 OF 15 HCA COPYRIGHT 2002 ACS

136:297394 Solid **electrolyte cell**. Goto, Shuji; Hosoya, Mamoru; Endo, Takahiro (Sony Corporation, Japan). Eur. Pat. Appl. EP 1195826 A2 20020410, 16 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-123774 20011004. PRIORITY: JP 2000-306876 20001005.

AB A solid **electrolyte cell** in which cell characteristics are not deteriorated even on overdischarge to the cell voltage of 0 V, such that the shape of the cell encapsulated in the laminate film is maintained. The cell includes a **cathode** contg. a compd. represented by the general formula $\text{Li}_x\text{Fe}_y\text{M}_z\text{PO}_4$ where $0.05 \leq x \leq 1.2$, $0 \leq y \leq 0.8$, and M is at least one selected from the group consisting of Mn, Cr, Co, Cu, Ni, V, Mo, Ti, Zn, Al, Ga, Mg, B and Nb, an anode and a solid **electrolyte**. An electrode unit 1

comprised of the **cathode** and the anode layered together with interposition of the solid **electrolyte** is encapsulated with a laminate film 2.

IT 407606-34-2, Iron lithium manganese phosphate
(Fe0.2-1Li0.05-1.2Mn0-0.8(PO4))
(solid **electrolyte cell**)
RN 407606-34-2 HCA
CN Iron lithium manganese phosphate (Fe0.2-1Li0.05-1.2Mn0-0.8(PO4))
(9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	1	14265-44-2
Mn	0 - 0.8	7439-96-5
Li	0.05 - 1.2	7439-93-2
Fe	0.2 - 1	7439-89-6

IC ICM H01M004-58

ICS H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **battery solid electrolyte**

IT Polyoxyalkylenes, uses
(lithium complex; solid **electrolyte cell**)

IT **Battery cathodes**
Secondary **batteries**
(solid **electrolyte cell**)

IT Fluoropolymers, uses
(solid **electrolyte cell**)

IT 7439-93-2D, Lithium, polyethylene oxide complex 7791-03-9, Lithium perchlorate 12031-65-1, Lithium nickel oxide linio2 12057-17-9, Lithium manganese oxide limn2o4 15365-14-7, Iron lithium phosphate felipo4 25322-68-3D, Polyethylene oxide, lithium complex 116327-69-6, Cobalt lithium nickel oxide Co0.1LiNi0.9O2 147812-18-8, Iron lithium manganese oxide Fe0.05LiMn1.95O4 407606-22-8, Chromium iron lithium phosphate (Cr0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-24-0, Cobalt iron lithium phosphate (Co0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-26-2, Copper iron lithium phosphate (Cu0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-28-4, Aluminum iron lithium phosphate (Al0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-30-8, Gallium iron lithium phosphate (Ga0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-32-0, Boron iron lithium phosphate (B0-0.8Fe0.2-1Li0.05-1.2(PO4)) 407606-34-2, Iron lithium manganese phosphate (Fe0.2-1Li0.05-1.2Mn0-0.8(PO4)) 407606-36-4, Iron lithium nickel phosphate (Fe0.2-1Li0.05-1.2Ni0-0.8(PO4)) 407606-39-7, Iron lithium vanadium phosphate (Fe0.2-1Li0.05-1.2V0-0.8(PO4)) 407606-42-2, Iron lithium molybdenum phosphate (Fe0.2-1Li0.05-1.2Mo0-0.8(PO4)) 407606-44-4, Iron lithium titanium phosphate (Fe0.2-1Li0.05-1.2Ti0-0.8(PO4)) 407606-47-7, Iron lithium zinc phosphate (Fe0.2-1Li0.05-1.2Zn0-0.8(PO4)) 407606-49-9, Iron lithium magnesium phosphate (Fe0.2-1Li0.05-1.2Mg0-

0.8(PO₄) 407606-51-3, Iron lithium niobium phosphate
 (Fe_{0.2}-1Li_{0.05}-1.2Nb₀-0.8(PO₄)) 408331-94-2, Cobalt lithium nickel
 oxide ((Co,Ni)LiO-2O₂) 408331-95-3, Cobalt lithium manganese oxide
 ((Co,Mn)LiO-2O₂) 408331-96-4, Cobalt lithium zinc oxide
 ((Co,Zn)LiO-2O₂) 408331-97-5, Cobalt lithium tin oxide
 ((Co,Sn)LiO-2O₂) 408331-99-7, Cobalt lithium vanadium oxide
 ((Co,V)LiO-2O₂) 408332-00-3, Cobalt lithium titanium oxide
 ((Co,Ti)LiO-2O₂) 408332-01-4, Cobalt lithium molybdenum oxide
 ((Co,Mo)LiO-2O₂) 408332-02-5, Cobalt lithium tungsten oxide
 ((Co,W)LiO-2O₂) 408332-03-6, Cobalt lithium magnesium oxide
 ((Co,Mg)LiO-2O₂) 408332-04-7, Cobalt lithium strontium oxide
 ((Co,Sr)LiO-2O₂) 408332-05-8, Cobalt lithium niobium oxide
 ((Co,Nb)LiO-2O₂) 408332-06-9, Cobalt iron lithium oxide
 ((Co,Fe)LiO-2O₂) 408332-07-0, Cobalt copper lithium oxide
 ((Co,Cu)LiO-2O₂) 408332-08-1, Aluminum cobalt lithium oxide
 ((Al,Co)LiO-2O₂) 408332-09-2, Cobalt lithium borate oxide
 (CoO-1LiO-2(BO₂)O-1O₂-2) 408332-10-5, Cobalt gallium lithium oxide
 ((Co,Ga)LiO-2O₂) 408332-11-6, Chromium cobalt lithium oxide
 ((Cr,Co)LiO-2O₂) 408332-12-7, Calcium cobalt lithium oxide
 ((Ca,Co)LiO-2O₂) 408332-13-8, Iron lithium nickel oxide
 ((Fe,Ni)LiO-2O₂) 408332-14-9, Copper lithium nickel oxide
 ((Cu,Ni)LiO-2O₂) 408332-15-0, Aluminum lithium nickel oxide
 ((Al,Ni)LiO-2O₂) 408332-16-1, Lithium nickel borate oxide
 (LiO-2NiO-1(BO₂)O-1O₂-2) 408332-17-2, Gallium lithium nickel oxide
 ((Ga,Ni)LiO-2O₂) 408332-18-3, Chromium lithium nickel oxide
 ((Cr,Ni)LiO-2O₂) 408332-19-4, Calcium lithium nickel oxide
 ((Ca,Ni)LiO-2O₂) 408332-20-7, Lithium manganese nickel oxide
 (LiO-2(Mn,Ni)O₂) 408332-21-8, Lithium nickel zinc oxide
 (LiO-2(Ni,Zn)O₂) 408332-22-9, Lithium nickel tin oxide
 (LiO-2(Ni,Sn)O₂) 408332-23-0, Lithium nickel vanadium oxide
 (LiO-2(Ni,V)O₂) 408332-24-1, Lithium nickel titanium oxide
 (LiO-2(Ni,Ti)O₂) 408332-25-2, Lithium nickel tungsten oxide
 (LiO-2(Ni,W)O₂) 408332-26-3, Lithium molybdenum nickel oxide
 (LiO-2(Mo,Ni)O₂) 408332-27-4, Lithium magnesium nickel oxide
 (LiO-2(Mg,Ni)O₂) 408332-28-5, Lithium nickel strontium oxide
 (LiO-2(Ni,Sr)O₂) 408332-29-6, Lithium nickel niobium oxide
 (LiO-2(Ni,Nb)O₂) 408332-30-9, Lithium manganese nickel oxide
 (LiO-2(Mn,Ni)O₂) 408332-31-0, Lithium manganese zinc oxide
 (LiO-2(Mn,Zn)O₂) 408332-32-1, Lithium manganese tin oxide
 (LiO-2(Mn,Sn)O₂) 408332-33-2, Lithium manganese vanadium oxide
 (LiO-2(Mn,V)O₂) 408332-34-3, Lithium manganese titanium oxide
 (LiO-2(Mn,Ti)O₂) 408332-35-4, Lithium manganese molybdenum oxide
 (LiO-2(Mn,Mo)O₂) 408332-36-5, Lithium manganese tungsten oxide
 (LiO-2(Mn,W)O₂) 408332-37-6, Lithium magnesium manganese oxide
 (LiO-2(Mg,Mn)O₂) 408332-38-7, Lithium manganese strontium oxide
 (LiO-2(Mn,Sr)O₂) 408332-39-8, Lithium manganese niobium oxide
 (LiO-2(Mn,Nb)O₂) 408332-40-1, Iron lithium manganese oxide
 ((Fe,Mn)2LiO-2O₄) 408332-42-3, Cobalt lithium manganese oxide
 ((Co,Mn)2LiO-2O₄) 408332-44-5, Aluminum lithium manganese oxide
 ((Al,Mn)2LiO-2O₄) 408332-45-6, Lithium manganese borate oxide
 (LiO-2MnO-2(BO₂)O-2O₂-4) 408332-46-7, Gallium lithium manganese
 oxide ((Ga,Mn)2LiO-2O₄) 408332-47-8, Chromium lithium manganese

oxide ((Cr,Mn)₂LiO-2O₄) 408332-48-9, Calcium lithium manganese
oxide ((Ca,Mn)₂LiO-2O₄) 408332-50-3 408332-58-1, Aluminum cobalt
lithium nickel oxide (Al_{0.01}Co_{0.98}LiNi_{0.01}O₂)
(solid electrolyte cell)

IT 96-49-1, Ethylene carbonate 108-32-7, Propylene carbonate
7782-42-5, Graphite, uses 12190-79-3, Cobalt lithium oxide colio₂
21324-40-3, Lithium hexafluorophosphate 24937-79-9, Pvd_f
(solid electrolyte cell)

L56 ANSWER 10 OF 15 HCA COPYRIGHT 2002 ACS

135:346864 **Cathode for nonaqueous
electrolyte lithium ion battery.** Yamada, Atsuo;
Yamahira, Takayuki (Sony Corporation, Japan). Eur. Pat. Appl. EP
1150368 A2 20011031, 26 pp. DESIGNATED STATES: R: AT, BE, CH, DE,
DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI,
RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-109919
20010424. PRIORITY: JP 2000-128998 20000425.

AB The lithium ion cell is improved appreciably in operational
stability under special conditions, such as high temps., and
exhibits superior characteristics against over-discharging, while
guaranteeing compatibility to the operating voltage of a
conventional lithium ion cell and an energy d. equiv. to that of the
conventional lithium ion cell. To this end, the lithium ion cell
includes a pos. electrode, a neg. electrode and
a nonaq. electrolyte, and uses, as a pos
. electrode active material, a composite material of a
first lithium compd. represented by the general formula LixMyPO₄,
where 0 < x < 2, 0.8 < y < 1.2 and M contains Fe, and a second lithium
compd. having a potential holder than the potential of the first
lithium compd.

IT 19414-36-9, Iron lithium manganese phosphate
((Fe,Mn)Li(PO₄))
(cathode for nonaq. electrolyte
lithium ion battery)

RN 19414-36-9 HCA

CN Iron lithium manganese phosphate ((Fe,Mn)Li(PO₄)) (9CI) (CA INDEX
NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	1	14265-44-2
Mn	0 - 1	7439-96-5
Li	1	7439-93-2
Fe	0 - 1	7439-89-6

IC ICM H01M004-58
ICS C01G049-00; C01B025-30; C01B025-45; H01M004-38

CC 52-2 (Electrochemical, Radiational, and Thermal Energy
Technology)

ST lithium nonaq electrolyte cathode

IT Charcoal

(activated; cathode for nonaq. electrolyte lithium ion battery)

IT Battery cathodes
(cathode for nonaq. electrolyte lithium ion battery)

IT Carbon fibers, uses
Carbonaceous materials (technological products)
Coke
Petroleum coke
(cathode for nonaq. electrolyte lithium ion battery)

IT Carbon black, uses
(cathode for nonaq. electrolyte lithium ion battery)

IT Fluoropolymers, uses
(cathode for nonaq. electrolyte lithium ion battery)

IT Organic compounds, uses
(high mol., sintered; cathode for nonaq. electrolyte lithium ion battery)

IT Secondary batteries
(lithium; cathode for nonaq. electrolyte lithium ion battery)

IT Coke
(needle; cathode for nonaq. electrolyte lithium ion battery)

IT Coke
(pitch; cathode for nonaq. electrolyte lithium ion battery)

IT Furan resins
Phenolic resins, uses
(sintered and carbonized; cathode for nonaq. electrolyte lithium ion battery)

IT 50-21-5D, Lactic acid, ester 60-29-7, Diethyl ether, uses
64-19-7D, Acetic acid, ester, uses 75-05-8, Acetonitrile, uses
79-09-4D, Propionic acid, ester 96-47-9, 2-Methyltetrahydrofuran
96-48-0 96-49-1, Ethylene carbonate 100-66-3, Anisole, uses
105-58-8, Diethyl carbonate 107-12-0, Propionitrile 108-32-7,
Propylene carbonate 109-99-9, Thf, uses 110-71-4,
1,2-Dimethoxyethane 126-33-0, Sulfolane 409-21-2, Silicon
carbide sic, uses 554-12-1, Methyl propionate 616-38-6, Dimethyl
carbonate 623-42-7, Methyl butyrate 623-96-1, Dipropyl carbonate
629-14-1, 1,2-Diethoxyethane 646-06-0, 1,3-Dioxolane 872-36-6,
Vinylene carbonate 1072-47-5, 4-Methyl-1,3-dioxolane 1313-08-2
2550-62-1, Lithium methanesulfonate 4437-85-8, Butylene carbonate
7439-93-2, Lithium, uses 7440-50-8, Copper, uses 7447-41-8,
Lithium chloride, uses 7550-35-8, Lithium bromide 7782-42-5,
Graphite, uses 7791-03-9, Lithium perchlorate 9003-07-0,
Polypropylene 12007-81-7, Silicon tetraboride 12008-29-6,
Silicon hexaboride 12013-56-8, Calcium disilicide 12017-12-8,
Cobalt disilicide 12018-09-6, Chromium disilicide 12022-99-0,
Iron disilicide 12032-86-9, Manganese disilicide 12033-76-0,

- Silicon nitride oxide $\text{Si}_2\text{N}_2\text{O}$ 12033-89-5, Silicon nitride, uses 12034-80-9, Niobium disilicide 12039-79-1, Tantalum disilicide 12039-83-7, Titanium silicide TiSi_2 12039-87-1, Vanadium disilicide 12039-88-2, Tungsten disilicide 12059-14-2, Nickel silicide (Ni_2Si) 12136-78-6, Molybdenum disilicide 12159-07-8, Copper silicide Cu_5Si 12190-79-3, Cobalt lithium oxide CoLiO_2 12201-89-7, Nickel disilicide 14283-07-9, Lithium tetrafluoroborate 14485-20-2, Lithium tetraphenylborate 15365-14-7, Iron lithium phosphate FeLiPO_4 19414-36-9, Iron lithium manganese phosphate ($(\text{Fe},\text{Mn})\text{Li}(\text{PO}_4)$) 21324-40-3, Lithium hexafluorophosphate 22831-39-6, Magnesium silicide (Mg_2Si) 29935-35-1, Lithium hexafluoroarsenate 33454-82-9, Lithium trifluoromethanesulfonate 35678-71-8, Methylsulfolane 90076-65-6 113066-89-0, Cobalt lithium nickel oxide $\text{Co}_{0.2}\text{LiNi}_{0.8}\text{O}_2$ 113671-38-8, Silicon oxide SiO_2 160479-36-7, Lithium tin oxide 178958-56-0, Lithium silicon oxide 300858-61-1 339333-78-7, Zinc silicide ZnSi_2 371148-86-6, Tin oxide (SnO_2) 371148-87-7, Lithium magnesium manganese oxide ($\text{LiMg}_{0.2}\text{Mn}_{0.8}\text{O}_2$)
 (cathode for nonaq. electrolyte lithium ion battery)
 IT 24937-79-9, PvdF
 (cathode for nonaq. electrolyte lithium ion battery)
 IT 7440-44-0, Carbon, uses
 (pyrocarbon; cathode for nonaq. electrolyte lithium ion battery)

L56 ANSWER 11 OF 15 HCA COPYRIGHT 2002 ACS

135:346863 Cathode active material for nonaqueous electrolyte battery. Li, Guohua; Yamada, Atsuo

(Sony Corporation, Japan). Eur. Pat. Appl. EP 1150367 A2 20011031, 47 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-109945 20010424. PRIORITY: JP 2000-128999 20000425; JP 2000-129000 20000425.

AB A pos. electrode active material and a nonaq. electrolyte cell which uses the pos. electrode active material are disclosed. The cell has a high discharge voltage without lowering the capacity and superior charging/discharging characteristics. To this end, the pos. electrode active material contains a compd. represented by the general formula $\text{Li}_x\text{MnyFe}_{1-y}\text{PO}_4$, wherein $0 < x \leq 2$ and $0.5 < y < 0.95$, or a compd. represented by the general formula $\text{Li}_x\text{MnyAl}_{1-y}\text{PO}_4$, where $0 < x \leq 2$ and $0 < y < 1$ and wherein A is a metal element selected from among Ti, Zn, Mg and Co or plural metal elements selected from among Ti, Fe, Zn, Mg and Co.

IT 371145-93-6, Iron lithium manganese phosphate ($\text{Fe}_{0.05-0.5}\text{Li}_{0.5-2}\text{Mn}_{0.5-0.95}(\text{PO}_4)$)
 (cathode active material for nonaq. electrolyte battery)

RN 371145-93-6 HCA

CN Iron lithium manganese phosphate ($\text{Fe}_{0.05-0.5}\text{Li}_{0-2}\text{Mn}_{0.5-0.95}(\text{PO}_4)$)
(9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	1	14265-44-2
Mn	0.5 - 0.95	7439-96-5
Li	0 - 2	7439-93-2
Fe	0.05 - 0.5	7439-89-6

IC ICM H01M004-50

ICS H01M004-58

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **cathode active material nonaq electrolyte battery**

IT **Battery cathodes**
(cathode active material for nonaq. electrolyte battery)

IT Carbon black, uses
(cathode active material for nonaq. electrolyte battery)

IT Fluoropolymers, uses
(cathode active material for nonaq. electrolyte battery)

IT Secondary batteries
(lithium; cathode active material for nonaq. electrolyte battery)

IT 108-32-7, Propylene carbonate 616-38-6, Dimethylcarbonate
7429-90-5, Aluminum, uses 21324-40-3, Lithium hexafluorophosphate
371145-93-6, Iron lithium manganese phosphate
($\text{Fe}_{0.05-0.5}\text{Li}_{0-2}\text{Mn}_{0.5-0.95}(\text{PO}_4)$)
(cathode active material for nonaq. electrolyte battery)

IT 207462-44-0P 300858-61-1P 371145-94-7P 371145-95-8P
371145-97-0P 371145-99-2P 371146-01-9P 371146-06-4P
371146-11-1P
(cathode active material for nonaq. electrolyte battery)

IT 24937-79-9, PvdF
(cathode active material for nonaq. electrolyte battery)

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135:259711 Reaction mechanism of the olivine-type Lix ($\text{Mn}_{0.6}\text{Fe}_{0.4}$) PO_4 (0
.ltoreq. x .ltoreq. 1). Yamada, Atsuo; Kudo, Yoshihiro; Liu,
Kuang-Yu (Technical Support Center, Frontier Science Laboratories,
Yokohama, 240-0036, Japan). Journal of the Electrochemical Society,
148(7), A747-A754 (English) 2001. CODEN: JESQAN. ISSN: 0013-4651.
Publisher: Electrochemical Society.

AB The charge-discharge reaction mechanism of the olivine-type

$\text{Li}_x(\text{Mn}_{0.6}\text{Fe}_{0.4})\text{PO}_4$ (0 .ltoreq. x .ltoreq. 1.0), a possible 4 V class **cathode** material for lithium **batteries**, was investigated using equil. voltage measurements, X-ray diffraction, Moessbauer spectroscopy, and X-ray absorption spectroscopy. The flat two-phase region with an open-circuit voltage (OCV) of ca. 4.1 V (region I: 0 .ltoreq. x .ltoreq. 0.6, $\text{Mn}^{3+}/\text{Mn}^{2+}$) and the S-curved single-phase region with OCV .apprxeq. 3.5 V (region II: 0.6 .ltoreq. x .ltoreq. 1.0, $\text{Fe}^{3+}/\text{Fe}^{2+}$) were clearly identified together with the corresponding change in the unit cell dimensions of the orthorhombic lattice. These features show significant differences from the reaction mechanism of Li_xFePO_4 (0 .ltoreq. x .ltoreq. 1), in which the whole $\text{Fe}^{3+}/\text{Fe}^{2+}$ reaction proceeds in a two-phase manner ($\text{LiFePO}_4\text{-FePO}_4$) with a flat voltage profile at 3.4 V.

IT 361393-19-3, Iron lithium manganese phosphate
($\text{Fe}_{0.4}\text{Li}_{0-1}\text{Mn}_{0.6}(\text{PO}_4)$)
(reaction mechanism of the olivine-type $\text{Li}_x(\text{Mn}_{0.6}\text{Fe}_{0.4})\text{PO}_4$ (0 .ltoreq. x .ltoreq. 1) **cathode** material for lithium **batteries**)
RN 361393-19-3 HCA
CN Iron lithium manganese phosphate ($\text{Fe}_{0.4}\text{Li}_{0-1}\text{Mn}_{0.6}(\text{PO}_4)$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	1	14265-44-2
Mn	0.6	7439-96-5
Li	0 - 1	7439-93-2
Fe	0.4	7439-89-6

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST lithium secondary **batteries cathode** iron lithium manganese phosphate
IT Secondary **batteries**
(lithium; reaction mechanism of the olivine-type $\text{Li}_x(\text{Mn}_{0.6}\text{Fe}_{0.4})\text{PO}_4$ (0 .ltoreq. x .ltoreq. 1) **cathode** material for lithium **batteries**)
IT **Cathodes**
(reaction mechanism of the olivine-type $\text{Li}_x(\text{Mn}_{0.6}\text{Fe}_{0.4})\text{PO}_4$ (0 .ltoreq. x .ltoreq. 1) **cathode** material for lithium **batteries**)
IT 361393-19-3, Iron lithium manganese phosphate
($\text{Fe}_{0.4}\text{Li}_{0-1}\text{Mn}_{0.6}(\text{PO}_4)$)
(reaction mechanism of the olivine-type $\text{Li}_x(\text{Mn}_{0.6}\text{Fe}_{0.4})\text{PO}_4$ (0 .ltoreq. x .ltoreq. 1) **cathode** material for lithium **batteries**)

L56 ANSWER 13 OF 15 HCA COPYRIGHT 2002 ACS
130:170706 Lithium mixed oxide **cathode** active materials, **cathodes** using the materials, and lithium **batteries** using them. Amine, Khalil (Japan Storage Battery Co., Ltd., Japan).

~~Jpn. Kokai Tokkyo Koho JP 11025983 A2 19990129 Heisei, 22 pp.~~
 (Japanese). CODEN: JKXXAF. APPLICATION: JP 1997-215424 19970704.

AB The active materials comprise $\text{LiM}_{11}\text{-xM}_2\text{xPO}_4$ ($\text{M}_1 = \text{Co, Ni, Mn}$; $\text{M}_2 = \text{Mg, Fe, Ni, Co, Mn, Zn, Ge, Cu, Cr}$; $x = 0\text{-}0.5$) having the olivine structure. The materials, which may have a rhombic structure, may be (1) LiMnPO_4 with lattice parameters of $a = 6.11 \pm 0.50 \text{ \AA}$, $b = 10.46 \pm 0.50 \text{ \AA}$, and $c = 4.73 \pm 0.50 \text{ \AA}$, (2) LiNiPO_4 with lattice parameters of $a = 5.86 \pm 0.50 \text{ \AA}$, $b = 10.07 \pm 0.20 \text{ \AA}$, $c = 4.68 \pm 0.50 \text{ \AA}$, or (3) LiCoPO_4 having lattice parameters of $a = 5.92 \pm 0.50 \text{ \AA}$, $b = 10.21 \pm 0.50 \text{ \AA}$, and $c = 4.70 \pm 0.50 \text{ \AA}$. **Cathodes** using the materials and **batteries** using the **cathodes**, **electrolyte** solns., and anode active materials contg. Li, Li alloys, Li_xSnO_2 , and C materials are also claimed. Li **batteries** with high energy d. and high voltage are obtained.

IT **220334-05-4P**, Iron lithium manganese phosphate ($\text{Fe}_{0.5}\text{LiMn}_{0.5}\text{-1(PO}_4\text{)}$)
 (Li mixed oxides of olivine structure as **cathode** active materials for high-energy-d. and high-voltage Li **batteries**)

RN 220334-05-4 HCA

CN Iron lithium manganese phosphate ($\text{Fe}_{0.5}\text{LiMn}_{0.5}\text{-1(PO}_4\text{)}$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	1	14265-44-2
Mn	0.5 - 1	7439-96-5
Li	1	7439-93-2
Fe	0 - 0.5	7439-89-6

IC ICM H01M004-58
 ICS C01B025-45; H01M004-02; H01M010-40

CC **52-2** (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 75

ST olivine lithium phosphorus oxide **cathode battery**

IT **Battery anodes**
Battery cathodes
Battery electrolytes
 (Li mixed oxides of olivine structure as **cathode** active materials for high-energy-d. and high-voltage Li **batteries**)

IT Oxides (inorganic), uses
 (Li mixed oxides of olivine structure as **cathode** active materials for high-energy-d. and high-voltage Li **batteries**)

IT **Secondary batteries**
 (lithium; Li mixed oxides of olivine structure as **cathode** active materials for high-energy-d. and high-voltage Li **batteries**)

- IT Crystal structure types
(rhombic; Li mixed oxides of olivine structure as **cathode** active materials for high-energy-d. and high-voltage Li **batteries**)
- IT Lithium alloy
(anode; Li mixed oxides of olivine structure as **cathode** active materials for high-energy-d. and high-voltage Li **batteries**)
- IT 13824-63-0P 13826-59-0P, Lithium manganese phosphate (LiMnPO_4)
13977-83-8P, Lithium nickel phosphate (LiNiPO_4) 220333-99-3P,
Lithium magnesium manganese phosphate ($\text{LiMg}_{0.5}\text{Mn}_{0.5}\text{PO}_4$)
220334-01-0P, Lithium manganese nickel phosphate
($\text{LiMn}_{0.5}\text{Ni}_{0.5}\text{PO}_4$) 220334-04-3P, Cobalt lithium manganese
phosphate ($\text{Co}_{0.5}\text{LiMn}_{0.5}\text{PO}_4$) **220334-05-4P**, Iron
lithium manganese phosphate ($\text{Fe}_{0.5}\text{LiMn}_{0.5}\text{PO}_4$) 220334-06-5P,
Lithium magnesium nickel phosphate ($\text{LiMg}_{0.5}\text{Ni}_{0.5}\text{PO}_4$)
220334-07-6P, Lithium manganese nickel phosphate
($\text{LiMn}_{0.5}\text{Ni}_{0.5}\text{PO}_4$) 220334-08-7P, Cobalt lithium nickel
phosphate ($\text{Co}_{0.5}\text{LiNi}_{0.5}\text{PO}_4$) 220334-09-8P, Iron lithium
nickel phosphate ($\text{Fe}_{0.5}\text{LiNi}_{0.5}\text{PO}_4$)
(Li mixed oxides of olivine structure as **cathode** active
materials for high-energy-d. and high-voltage Li
batteries)
- IT 7439-93-2, Lithium, uses 7440-44-0, Carbon, uses 160479-36-7,
Lithium tin oxide
(anode; Li mixed oxides of olivine structure as **cathode**
active materials for high-energy-d. and high-voltage Li
batteries)
- IT 21324-40-3, Lithium phosphorus fluoride (LiPF_6)
(**electrolyte**; Li mixed oxides of olivine structure as
cathode active materials for high-energy-d. and
high-voltage Li **batteries**)
- IT 7440-47-3, Chromium, uses 7440-50-8, Copper, uses 7440-56-4,
Germanium, uses 7440-66-6, Zinc, uses
(mixed oxides contg.; Li mixed oxides of olivine structure as
cathode active materials for high-energy-d. and
high-voltage Li **batteries**)

L56 ANSWER 14 OF 15 HCA COPYRIGHT 2002 ACS

126:133614 The phosphate mineral association of the granitic pegmatites of the Fregeneda area (Salamanca, Spain). Roda, E.; Fontan, F.; Pesquera, A.; Velasco, F. (Dept. Mineralogia Petrologia, Univ. Paris Vasco/EHU, Bilbao, 48080, Spain). Mineralogical Magazine, 60(402), 767-778 (English) 1996. CODEN: MNLMBB. ISSN: 0026-461X. Publisher: Mineralogical Society.

AB In the Fregeneda area different pegmatitic types can be distinguished on the basis of their mineralogy, internal structure and field relationships. The most common type corresponds with simple pegmatites with a homogeneous internal structure, but Li and Sn-bearing pegmatites are also relatively widespread, besides a minority group of Fe-Mn phosphate-bearing pegmatites that has recently been characterized. These pegmatites are located in an

intermediate zone, between the barren pegmatites and the most evolved Li and Sn-bearing bodies, and they carry a complex assocn. of phosphate minerals. The study of these phosphates has allowed the identification of wyllieite, graftonite, sarcopside, triplite-zwieselite and ferrisicklerite as the primary phases. The secondary phosphates are rosemaryite, heterosite-purpurite, alluaudite and vayrynenite. The main characteristics of these phosphate minerals are reported, including their chem. compn., analyzed by electron microprobe, and their unit-cell parameters, calcd. using x-ray powder diffraction techniques. A common transformation mechanism in this phosphate assocn. is the oxidn. of the transition metal cations at the same time as Na-leaching in wyllieite to generate rosemaryite, and Li-leaching in ferrisicklerite to general heterosite. The occurrence of sarcopside lamellae in ferrisicklerite and heterosite is evidence of the replacement processes of the former by the latter. A Na-metasomatic replacement of the early phosphates as ferrisicklerite and graftonite, producing alluaudite, is also a well developed process. Phosphate minerals occur in pegmatites with an intermediate degree of fractionation, appearing between the barren and the more evolved pegmatites with Li and Sn, which is in agreement with the pegmatite field zonation established in the literature.

IT 12199-35-8, Sicklerite
 (compn. and petrog. features; primary and secondary phosphate minerals in the granitic pegmatites of the Fregeneda area, Spain)
 RN 12199-35-8 HCA
 CN Sicklerite (8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	1	14265-44-2
Mn	0.5 - 1	7439-96-5
Li	1	7439-93-2
Fe	0 - 0.5	7439-89-6

IT 12415-62-2, Ferrisicklerite
 (compn. and petrog. relations and unit-cell parameters;
primary and secondary phosphate minerals in the granitic
 pegmatites of the Fregeneda area, Spain)
 RN 12415-62-2 HCA
 CN Ferrisicklerite (8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	1	14265-44-2
Mn	0 - 0.5	7439-96-5
Li	0 - 0.5	7439-93-2
Fe	0.5 - 1	7439-89-6

CC 53-1 (Mineralogical and Geological Chemistry)

- IT Apatite-group minerals
(compn. and petrog. features and unit-cell parameters;
primary and secondary phosphate minerals in the granitic
pegmatites of the Fregeneda area, Spain)
- IT 1306-05-4, Fluorapatite 12274-74-7, Sarcopside
(compn. and petrog. features and unit-cell parameters;
primary and secondary phosphate minerals in the granitic
pegmatites of the Fregeneda area, Spain)
- IT 1302-58-5, Amblygonite **12199-35-8**, Sicklerite
12274-58-7, Graftonite 12274-72-5, Purpurite 12425-63-7,
Vayrynenite 12426-14-1, Zwieselite 72276-47-2, Ferro-alluaudite
105016-17-9, Alluaudite 164034-63-3, Wyllieite 186361-98-8,
Magnesian zwieselite 186362-02-7, Hagendorfite-Mn₂+Na
186362-03-8, Wyllieite-Mn₂+Na
(compn. and petrog. features; primary and secondary phosphate
minerals in the granitic pegmatites of the Fregeneda area, Spain)
- IT **12415-62-2**, Ferrisicklerite
(compn. and petrog. relations and unit-cell parameters;
primary and secondary phosphate minerals in the granitic
pegmatites of the Fregeneda area, Spain)

L56 ANSWER 15 OF 15 HCA COPYRIGHT 2002 ACS

68:91198 Magnetic susceptibility of 34 manganese-bearing minerals.

Powell, Howard E.; Ballard, Lee N. (Rolla Met. Res. Center, Bur. of
Mines, Rolla, Mo., USA). Inf. Circ. - U. S., Bur. Mines, No. 8359,
10 pp. (English) 1968. CODEN: XIMIAL.

AB All susceptibilities were detd. by the Faraday method using a Varian
V-4004, 4-in. electromagnet. The source of each sample and
petrographic, spectrographic, and chem. analyses are given. Values
ranged from 22.8 .times. 10⁻⁶ c.g.s. units for a sample of
coronadite (MnPbMn₆O₁₄) to 824 .times. 10⁻⁶ for a sample of
franklinite (Mn_{0.18}Zn_{0.82})O.Fe₂O₃. Detns. were made at 20-3.degree.
on -270-mesh samples at a flux d. of 20,000 gauss.

IT **12199-35-8 17548-96-8**
(magnetic susceptibility of)

RN 12199-35-8 HCA

CN Sicklerite (8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	1	14265-44-2
Mn	0.5 - 1	7439-96-5
Li	1	7439-93-2
Fe	0 - 0.5	7439-89-6

RN 17548-96-8 HCA

CN Lithiophilite, ferroan (8CI, 9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		

O4P	1	14265-44-2
Mn	0.5 - 0.9	7439-96-5
Li	1	7439-93-2
Fe	0.1 - 0.5	7439-89-6

CC 72 (Magnetic Phenomena)

IT 1309-54-2 1309-55-3 1310-98-1 1313-12-8 1317-55-1
 1318-06-5 1332-08-7 12025-98-8 12032-72-3 12033-13-5
 12172-90-6 12173-49-8 12174-34-4 12199-35-8
 12199-51-8 12209-34-6 12260-01-4 12274-64-5 12274-78-1
 12426-56-1 14567-57-8 14854-26-3 17499-18-2 17548-96-8
 18972-84-4 18972-86-6 18972-96-8
 (magnetic susceptibility of)

=> d 157 1-9 cbib abs hitstr hitind

L57 ANSWER 1 OF 9 HCA COPYRIGHT 2002 ACS

137:203995 Method of preparation and **battery** use of lithium based phosphates. Barker, Jeremy; Saidi, M. Yazid (Valence Technology, Inc., USA). U.S. US 6447951 B1 20020910, 25 pp., Cont.-in-part of U.S. 5,871,866. (English). CODEN: USXXAM. APPLICATION: US 1998-195961 19981119. PRIORITY: US 1996-717919 19960923.

AB A lithium ion **battery** comprises: a first electrode having an active material in a first condition of the nominal general formula $\text{Li}_{3-x}\text{M}'\text{yM}''_{2-y}(\text{PO}_4)_3$, $x = 0$, $0 < y < 2$ and in a second condition of the nominal general formula: $\text{Li}_{3-x}\text{M}'\text{yM}''_{2-y}(\text{PO}_4)_3$, $0 < x \leq 3$, wherein M' is Zr or Ti and M'' is a metal selected from V, Cr, Mn, Fe, Co, Ni, Cu, Sn, Pb, Mo, W, Cd, Zn, and Pd, with the proviso that when M' is Ti, M'' is not Fe; a second electrode which is a counter-electrode to the first electrode; and an **electrolyte** between the electrodes.

IT 204653-30-5P, Lithium vanadium phosphate $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ (method of prepn. and **battery** use of lithium based phosphates)

RN 204653-30-5 HCA

CN Lithium vanadium phosphate ($\text{Li}_3\text{V}_2(\text{PO}_4)_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

IC ICM H01M004-58

NCL 429218100

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 Section cross-reference(s): 49

ST **battery** electrode lithium metal phosphorous compd

IT Secondary **batteries**

- (lithium; method of prepn. and **battery** use of lithium based phosphates)
- IT **Battery cathodes**
(method of prepn. and **battery** use of lithium based phosphates)
- IT 7439-93-2, Lithium, uses 7440-44-0, Carbon, uses 7782-42-5, Graphite, uses
(method of prepn. and **battery** use of lithium based phosphates)
- IT 204653-30-5P, Lithium vanadium phosphate $\text{Li}_3\text{V}_2(\text{PO}_4)_3$
204653-32-7P, Aluminum lithium vanadium phosphate $\text{AlLi}_3\text{V}(\text{PO}_4)_3$
270258-22-5P, Lithium manganese zirconium phosphate $\text{Li}_3\text{MnZr}(\text{PO}_4)_3$
(method of prepn. and **battery** use of lithium based phosphates)

L57 ANSWER 2 OF 9 HCA COPYRIGHT 2002 ACS

136:282003 Lithium-based **cathode** active materials for rechargeable lithium **battery** and preparation thereof. Barker, Jeremy; Saidi, M. Yazid; Swoyer, Jeffrey L. (UK). U.S. Pat. Appl. Publ. US 20020039687 A1 20020404, 39 pp., Cont.-in-part of U. S. Ser. No. 484,799. (English). CODEN: USXXCO. APPLICATION: US 2001-908480 20010718. PRIORITY: US 2000-484799 20000118; WO 2000-US35302 20001222.

AB The invention provides novel lithium-mixed metal materials which, upon electrochem. interaction, release lithium ions, and are capable of reversibly cycling lithium ions. The invention provides a rechargeable lithium **battery** which comprises an electrode formed from the novel lithium-mixed metal materials. Methods for making the novel lithium-mixed metal materials and methods for using such lithium-mixed metal materials in **electrochem. cells** are also provided. The lithium-mixed metal materials comprise lithium and at least one other metal besides lithium. Preferred materials are lithium-mixed metal phosphates which contain lithium and two other metals besides lithium.

IT 204653-30-5P, Lithium vanadium phosphate $\text{Li}_3\text{V}_2(\text{PO}_4)_3$
(lithium-based **cathode** active materials for rechargeable lithium **battery** and prepn. thereof)

RN 204653-30-5 HCA

CN Lithium vanadium phosphate ($\text{Li}_3\text{V}_2(\text{PO}_4)_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

IC ICM H01M004-58

ICS C01B025-45

NCL 429231950

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **battery cathode** lithium based active material

- IT **Battery cathodes**
 (lithium-based **cathode** active materials for
 rechargeable lithium **battery** and prepn. thereof)
- IT Olivine-group minerals
 (lithium-based **cathode** active materials for
 rechargeable lithium **battery** and prepn. thereof)
- IT **Secondary batteries**
 (lithium; lithium-based **cathode** active materials for
 rechargeable lithium **battery** and prepn. thereof)
- IT 405914-52-5, Cobalt lithium magnesium phosphate ((Co,Mg)Li(PO₄))
 405914-53-6, Cobalt lithium magnesium phosphate (Co_{0.9}LiMg_{0.1}(PO₄))
 405914-58-1, Cobalt lithium magnesium phosphate
 (Co_{0.95}LiMg_{0.05}(PO₄)) 405914-63-8 405914-68-3, Calcium cobalt
 lithium phosphate ((Ca,Co)Li(PO₄)) 405914-73-0, Calcium cobalt
 lithium phosphate (Ca_{0.1}Co_{0.9}Li(PO₄)) 405914-83-2, Cobalt lithium
 zinc phosphate ((Co,Zn)Li(PO₄)) 405914-88-7, Cobalt lithium zinc
 phosphate (Co_{0.9}LiZn_{0.1}(PO₄)) 405914-93-4, Cobalt lithium
 strontium phosphate ((Co,Sr)Li(PO₄)) 405914-98-9, Cobalt lead
 lithium phosphate ((Co,Pb)Li(PO₄)) 405915-04-0, Cadmium cobalt
 lithium phosphate ((Cd,Co)Li(PO₄)) 405915-09-5, Cobalt lithium tin
 phosphate ((Co,Sn)Li(PO₄)) 405915-14-2, Barium cobalt lithium
 phosphate ((Ba,Co)Li(PO₄)) 405915-21-1, Beryllium cobalt lithium
 phosphate ((Be,Co)Li(PO₄)) 405915-29-9, Cobalt lithium magnesium
 phosphate (Co_{0.5}-1LiMg_{0-0.5}(PO₄)) 405915-34-6, Cobalt lithium
 magnesium phosphate (Co_{0.8}-1LiMg_{0-0.2}(PO₄)) 405915-39-1, Calcium
 cobalt lithium phosphate (Ca_{0-0.5}Co_{0.5}-1Li(PO₄)) 405915-44-8,
 Calcium cobalt lithium phosphate (Ca_{0-0.2}Co_{0.8}-1Li(PO₄))
 405915-48-2, Cobalt lithium zinc phosphate (Co_{0.5}-1LiZn_{0-0.5}(PO₄))
 405915-51-7, Cobalt lithium zinc phosphate (Co_{0.8}-1LiZn_{0-0.2}(PO₄))
 405915-56-2, Cobalt lithium strontium phosphate (Co_{0.5}-1LiSr₀₋
 0.5(PO₄)) 405915-59-5, Cobalt lithium strontium phosphate
 (Co_{0.8}-1LiSr_{0-0.2}(PO₄)) 405915-63-1, Cobalt lead lithium phosphate
 (Co_{0.5}-1Pb_{0-0.5}Li(PO₄)) 405915-66-4, Cobalt lead lithium phosphate
 (Co_{0.8}-1Pb_{0-0.2}Li(PO₄)) 405915-69-7, Cadmium cobalt lithium
 phosphate (Cd_{0-0.5}Co_{0.5}-1Li(PO₄)) 405915-79-9, Cadmium cobalt
 lithium phosphate (Cd_{0-0.2}Co_{0.8}-1Li(PO₄)) 405915-82-4, Cobalt
 lithium tin phosphate (Co_{0.8}-1LiSn_{0-0.2}(PO₄)) 405915-85-7, Cobalt
 lithium tin phosphate (Co_{0.95}-1LiSn_{0-0.05}(PO₄)) 405915-88-0,
 Cobalt lithium tin phosphate (Co_{0.5}-1LiSn_{0-0.5}(PO₄)) 405915-90-4,
 Barium cobalt lithium phosphate (Ba_{0-0.5}Co_{0.5}-1Li(PO₄))
 405915-92-6, Barium cobalt lithium phosphate (Ba_{0-0.2}Co_{0.8}-1Li(PO₄))
 405915-94-8, Beryllium cobalt lithium phosphate (Be_{0-0.5}Co_{0.5}-
 1Li(PO₄)) 405915-96-0, Beryllium cobalt lithium phosphate
 (Be_{0-0.2}Co_{0.8}-1Li(PO₄))
 (lithium-based **cathode** active materials for
 rechargeable lithium **battery** and prepn. thereof)
- IT **204653-30-5P**, Lithium vanadium phosphate Li₃V₂(PO₄)₃
 349632-76-4P, Iron lithium magnesium phosphate (Fe_{0.9}LiMg_{0.1}(PO₄))
 349632-79-7P, Calcium iron lithium phosphate (Ca_{0.1}Fe_{0.9}Li(PO₄))
 349632-82-2P, Iron lithium zinc phosphate (Fe_{0.9}LiZn_{0.1}(PO₄))
 (lithium-based **cathode** active materials for
 rechargeable lithium **battery** and prepn. thereof)

L57 ANSWER 3 OF 9 HCA COPYRIGHT 2002 ACS

135:109741 Preparation of lithium-based electrochemically active materials for lithium **batteries**. Barker, Jeremy; Saidi, M. Yazid (Valence Technology, Inc., USA). PCT Int. Appl. WO 2001054212 A1 20010726, 97 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2000-US35302 20001222. PRIORITY: US 2000-484799 20000118.

AB The invention provides novel lithium-mixed metal materials which, upon electrochem. interaction, release lithium ions, and are capable of reversibly cycling lithium ions. The invention provides a rechargeable lithium **battery** which comprises an electrode formed from the novel lithium-mixed metal materials. Methods for making the novel lithium-mixed metal materials and methods for using such lithium-mixed metal materials in **electrochem. cells** are also provided. The lithium-mixed metal materials comprise lithium and at least one other metal besides lithium. Preferred materials are lithium-mixed metal phosphates which contain lithium and two other metals besides lithium.

IT **204653-30-5P**, Lithium vanadium phosphate $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ (prepn. of lithium-based electrochem. active materials for lithium **batteries**)

RN 204653-30-5 HCA

CN Lithium vanadium phosphate ($\text{Li}_3\text{V}_2(\text{PO}_4)_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

IC ICM H01M004-48

ICS H01M010-40

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49

ST **battery cathode** lithium mixed metal phosphate

IT **Secondary batteries**

(lithium; prepn. of lithium-based electrochem. active materials for lithium **batteries**)

IT **Battery cathodes**

(prepn. of lithium-based electrochem. active materials for lithium **batteries**)

IT Carbon black, uses

(prepn. of lithium-based electrochem. active materials for

- lithium **batteries**)
- IT EPDM rubber
(prepn. of lithium-based electrochem. active materials for lithium **batteries**)
- IT 96-49-1, Ethylene carbonate 616-38-6, Dimethyl carbonate
7439-93-2, Lithium, uses 12162-92-4, lithium vanadium oxide LiV_2O_5
21324-40-3, Lithium hexafluorophosphate
(prepn. of lithium-based electrochem. active materials for lithium **batteries**)
- IT 331622-65-2P, Iron lithium zinc phosphate ($\text{Fe}_{0.8}\text{LiZn}_{0.2}(\text{PO}_4)$)
349632-76-4P, Iron lithium magnesium phosphate ($\text{Fe}_{0.9}\text{LiMg}_{0.1}(\text{PO}_4)$)
349632-79-7P, Calcium iron lithium phosphate ($\text{Ca}_{0.1}\text{Fe}_{0.9}\text{Li}(\text{PO}_4)$)
349632-82-2P, Iron lithium zinc phosphate ($\text{Fe}_{0.9}\text{LiZn}_{0.1}(\text{PO}_4)$)
349632-85-5P 349632-88-8P
(prepn. of lithium-based electrochem. active materials for lithium **batteries**)
- IT 554-13-2, Lithium carbonate 1305-62-0, Calcium hydroxide, reactions
1309-37-1, Ferric oxide, reactions 1309-42-8,
Magnesium hydroxide 7440-44-0, Carbon, reactions 7779-90-0, Zinc phosphate
7783-28-0, Diammonium hydrogen phosphate 10045-86-0, iron phosphate FePO_4 13453-80-0, Lithium dihydrogen phosphate
14940-41-1, Iron phosphate $\text{Fe}_3(\text{PO}_4)_2$
(prepn. of lithium-based electrochem. active materials for lithium **batteries**)
- IT 15365-14-7P, iron lithium phosphate FeLiPO_4 204653-30-5P,
Lithium vanadium phosphate $\text{Li}_3\text{V}_2(\text{PO}_4)_3$
(prepn. of lithium-based electrochem. active materials for lithium **batteries**)

L57 ANSWER 4 OF 9 HCA COPYRIGHT 2002 ACS

- 134:149942 Enhancement of discharge capacity of $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ by stabilizing the orthorhombic phase at room temperature. Sato, Mineo; Ohkawa, Hirokazu; Yoshida, Kenji; Saito, Mai; Uematsu, Kazuyoshi; Toda, Kenji (Department of Chemistry and Chemical Engineering, Faculty of Engineering, Niigata University, Niigata, 950-2181, Japan). Solid State Ionics, 135(1-4), 137-142 (English) 2000. CODEN: SSIOD3. ISSN: 0167-2738. Publisher: Elsevier Science B.V..
- AB $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ and solid solns. of $\text{Li}_{3-2x}(\text{V}_{1-x}\text{Zr}_x)_2(\text{PO}_4)_3$ were prepd. by a solid state reaction. A high temp. orthorhombic phase of $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ with a .beta.- $\text{Fe}_2(\text{SO}_4)_3$ -type was successfully stabilized at room temp. by substituting Zr for V with substitution ratios beyond $x=0.05$. The pure material of $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ exhibited a **cathode** performance with two well defined regions of plateau at around 3.7 and 4.1 V vs. Li/Li⁺ upon charging and 3.6 and 4.0 V vs. Li/Li⁺ upon discharging, resp., suggesting two types of phases produced upon the charge/discharge process. On the other hand, the **cathode** performance of the orthorhombic stabilized materials showed almost the same charge/discharge voltages as those of the pure material, but, with two plateaus slightly sloping, showed a considerably improved charge/discharge cycle performance compared to that of the pure material. Such improvement on the charge/discharge

cycle performance is suggested to come from the disordered lithium ion arrangement in the orthorhombic phase.

IT 204653-30-5, Lithium vanadium phosphate($\text{Li}_3\text{V}_2(\text{PO}_4)_3$)
(enhancement of discharge capacity of $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ by stabilizing the orthorhombic phase at room temp.)
RN 204653-30-5 HCA
CN Lithium vanadium phosphate ($\text{Li}_3\text{V}_2(\text{PO}_4)_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **battery cathode** lithium vanadium zirconium phosphate
IT **Battery cathodes**
(enhancement of discharge capacity of $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ by stabilizing the orthorhombic phase at room temp.)
IT **Secondary batteries**
(lithium; enhancement of discharge capacity of $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ by stabilizing the orthorhombic phase at room temp.)
IT 204653-30-5, Lithium vanadium phosphate($\text{Li}_3\text{V}_2(\text{PO}_4)_3$)
323204-07-5, Lithium vanadium zirconium phosphate
($\text{Li}_{2.8}\text{V}_{1.8}\text{Zr}_{0.2}(\text{PO}_4)_3$) 323204-08-6, Lithium vanadium zirconium phosphate ($\text{Li}_{2.6}\text{V}_{1.6}\text{Zr}_{0.4}(\text{PO}_4)_3$)
(enhancement of discharge capacity of $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ by stabilizing the orthorhombic phase at room temp.)

L57 ANSWER 5 OF 9 HCA COPYRIGHT 2002 ACS

134:59010 Rhombohedral Form of $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ as a **Cathode** in Li-Ion **Batteries**. Gaubicher, J.; Wurm, C.; Goward, G.; Masquelier, C.; Nazar, L. (Department of Chemistry, University of Waterloo, Waterloo, ON, N2L 3G1, Can.). Chemistry of Materials, 12(11), 3240-3242 (English) 2000. CODEN: CMATEX. ISSN: 0897-4756. Publisher: American Chemical Society.

AB We report on the first prepn. of rhombohedral B- $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ by ion exchange from $\text{Na}_3\text{V}_2(\text{PO}_4)_3$ and on the first investigation of its electrochem. behavior upon Li extn., coupled with ex-situ x ray diffraction and solid state ^7Li NMR studies. Electrochem. oxidn. of B- $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ under slow potentiodynamic conditions (10 mV/1.5 h) up to 4.1 V followed by equilibration shows that almost 2 Li can be extd. from the framework. The charge-discharge profile of B- $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ under galvanostatic control confirms that 2 alkali cations/electrons can be extd. under these conditions, which minimize possible parasitic **electrolyte** oxidn.

IT 204653-30-5P, Lithium vanadium phosphate $\text{Li}_3\text{V}_2(\text{PO}_4)_3$
(rhombohedral form of $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ as **cathode** in Li-ion **batteries**)

RN 204653-30-5 HCA

CN Lithium vanadium phosphate ($\text{Li}_3\text{V}_2(\text{PO}_4)_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **battery cathode** lithium vanadium phosphate

IT Secondary **batteries**

(lithium; rhombohedral form of $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ as **cathode** in Li-ion **batteries**)

IT **Battery cathodes**

(rhombohedral form of $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ as a **cathode** in Li-ion **batteries**)

IT Ion exchange

(rhombohedral form of $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ as **cathode** in Li-ion **batteries**)

IT 204653-30-5P, Lithium vanadium phosphate $\text{Li}_3\text{V}_2(\text{PO}_4)_3$

(rhombohedral form of $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ as **cathode** in Li-ion **batteries**)

IT 7440-42-8, Boron, uses

(rhombohedral form of $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ as **cathode** in Li-ion **batteries**)

IT 69104-84-3

(rhombohedral form of $\text{Li}_3\text{V}_2(\text{PO}_4)_3$ as **cathode** in Li-ion **batteries**)

L57 ANSWER 6 OF 9 HCA COPYRIGHT 2002 ACS

133:7071 Lithium based phosphates for use in lithium ion

batteries and method of preparation. Barker, Jeremy; Saidi,

M. Yazid (Valence Technology, Inc., USA). PCT Int. Appl. WO

2000031812 A1 20000602, 69 pp. DESIGNATED STATES: W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2. APPLICATION: WO

1999-US23074 19991005. PRIORITY: US 1998-195961 19981119.

AB A Li ion **battery** comprises a first electrode having an active material in a first condition of the nominal general formula $\text{Li}_{3-x}\text{M}'_y\text{M}''_{2-y}(\text{PO}_4)_3$, $x = 0$, $y = 0-2$, and in a second condition of the nominal general formula $\text{Li}_{3-x}\text{M}'_y\text{M}''_{2-y}(\text{PO}_4)_3$, $x = 0-3$; M' is a transition metal and M'' is a nontransition metal selected from the group consisting of metals and metalloids; a second electrode which is a counter electrode to the first electrode; and an **electrolyte** between the electrodes.

IT 204653-30-5, Lithium vanadium phosphate $\text{Li}_3\text{V}_2(\text{PO}_4)_3$

(lithium based phosphates for use in lithium ion
batteries and method of prepn.)

RN 204653-30-5 HCA

CN Lithium vanadium phosphate (Li3V2(PO4)3) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

IC ICM H01M004-58

ICS H01M010-40; C01B025-45

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST lithium **battery cathode** lithium based phosphate

IT **Battery cathodes**

(lithium based phosphates for use in lithium ion
batteries and method of prepn.)

IT Carbonaceous materials (technological products)

(lithium based phosphates for use in lithium ion
batteries and method of prepn.)

IT Secondary **batteries**

(lithium; lithium based phosphates for use in lithium ion
batteries and method of prepn.)

IT 96-49-1, Ethylene carbonate 616-38-6, Dimethyl carbonate
7782-42-5, Graphite, uses 21324-40-3, Lithium hexafluorophosphate
204653-30-5, Lithium vanadium phosphate Li3V2(PO4)3
204653-32-7, Aluminum lithiumvanadium phosphate AlLi3V(PO4)3
270258-22-5

(lithium based phosphates for use in lithium ion
batteries and method of prepn.)

IT 554-13-2, Lithium carbonate 1314-23-4, Zirconia, reactions
1314-62-1, Vanadium pentoxide, reactions 1333-74-0, Hydrogen,
reactions 1344-43-0, Manganese oxide mno, reactions 7722-76-1,
Ammonium phosphate NH4H2PO4 7783-28-0 21645-51-2, Aluminum
hydroxide, reactions

(lithium based phosphates for use in lithium ion
batteries and method of prepn.)

IT 7440-44-0, Carbon, uses

(mesocarbon microbeads; lithium based phosphates for use in
lithium ion **batteries** and method of prepn.)

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130:314438 Lithium copper phosphorus oxide active materials for
batteries, battery cathodes, and

batteries. Amin, Carell (Japan Storage Battery Co., Ltd.,
Japan). Jpn. Kokai Tokkyo Koho JP 11111295 A2 19990423 Heisei, 24
pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1997-307817
19971003.

AB (Active material for **batteries** having compn. formula

LiCu1+xPO4 (x = 0-1) is claimed. The active materials are manufd.

by mixing Li_2CO_3 , CuO , and $(\text{NH}_4)_2\text{HPO}_4$ in a stoichiometric ratio, forming into pellets under 400 kg/cm² pressure, and 2-step heating 1st at 450.degree. and then at 800.degree.. Also claimed are Li **battery cathodes** comprising the active material, and **batteries** comprising the active material **cathodes, electrolytes**, and anodes comprising Li (alloys), Li_xSnO_2 , C, and/or graphite. The **batteries** have high capacity.

IT 223571-65-1P, Copper lithium phosphate ($\text{Cu}_{0.5-1}\text{Li}(\text{PO}_4)$)
(anode; lithium copper phosphorus oxide **cathode** active materials for lithium secondary **batteries**)
RN 223571-65-1 HCA
CN Copper lithium phosphate ($\text{Cu}_{0.5-1}\text{Li}(\text{PO}_4)$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	1	14265-44-2
Cu	0.5 - 1	7440-50-8
Li	1	7439-93-2

IT 223571-66-2P, Copper lithium phosphate ($\text{Cu}_{1.5-2}\text{Li}(\text{PO}_4)$)
(lithium copper phosphorus oxide **cathode** active materials for lithium secondary **batteries**)
RN 223571-66-2 HCA
CN Copper lithium phosphate ($\text{Cu}_{1.5-2}\text{Li}(\text{PO}_4)$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====	=====	=====
O4P	1	14265-44-2
Cu	1.5 - 2	7440-50-8
Li	1	7439-93-2

IC ICM H01M004-58
ICS H01M004-02; H01M010-40
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST lithium copper phosphorus oxide active material; secondary **battery** oxide **cathode** active material
IT **Battery cathodes**
Secondary **batteries**
(lithium copper phosphorus oxide **cathode** active materials for lithium secondary **batteries**)
IT Lithium alloy
(anodes; lithium copper phosphorus oxide **cathode** active materials for lithium secondary **batteries**)
IT 223571-65-1P, Copper lithium phosphate ($\text{Cu}_{0.5-1}\text{Li}(\text{PO}_4)$)
(anode; lithium copper phosphorus oxide **cathode** active materials for lithium secondary **batteries**)
IT 7439-93-2, Lithium, uses 7440-44-0, Carbon, uses 7782-42-5, Graphite, uses 160479-36-7, Lithium tin oxide
(anodes; lithium copper phosphorus oxide **cathode** active

- materials for lithium secondary **batteries**)
- IT 554-13-2, Lithium carbonate 1317-38-0, Copper monoxide, processes 7783-28-0, Diammonium hydrogenphosphate (cathode active materials from; lithium copper phosphorus oxide **cathode** active materials for lithium secondary **batteries**)
- IT 223571-66-2P, Copper lithium phosphate ($\text{Cu}_{1.5}\text{-2Li(PO}_4\text{)}$) (lithium copper phosphorus oxide **cathode** active materials for lithium secondary **batteries**)
- L57 ANSWER 8 OF 9 HCA COPYRIGHT 2002 ACS
- 129:191547 **Nonaqueous-electrolyte** lithium secondary **battery** having high discharge capacity. Nagata, Mikito; Karril, Amin; Tsukamoto, Kotobuki (Japan Storage Battery Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 10208730 A2 19980807 Heisei, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1997-25985 19970124.
- AB In the title **battery**, **cathode** contains a Li-contg. metal oxide as an active mass and another substance having Li+-discharging potential higher than that of the metal oxide and of amt. corresponding to an amt. of Li+ consumed in the initial charging. Preferably, the substance is selected from $\text{Li}_{1+x}\text{Mn}_2\text{O}_4$ ($X = 0\text{-}1$), Li_2NiO_2 , LiMnO_2 , $\text{Li}_2\text{Mn}_{2-x}\text{M}_x\text{O}_4$ ($M = \text{Co, Ni, Zn, Mg, Fe; } X = 0\text{-}2$), $\text{Li}_2\text{Mn}_{1.5}\text{Ni}_{0.5}\text{O}_4$, Li_xVO_3 ($X = 1\text{-}6$), $\text{Li}_3\text{Fe}_2(\text{PO}_4)_3$, $\text{Li}_3\text{Fe}_2(\text{SO}_4)_3$, $\text{Li}_3\text{FeV}(\text{PO}_4)_3$, and $\text{Li}_3\text{V}(\text{PO}_4)_3$. Anode in the **battery** may be selected from graphite, coke, (amorphous) carbon, SnO , SnO_2 , $\text{Sn}_{1-x}\text{M}_x\text{O}$ ($M = \text{Hg, P, B, Si, Ge, Sb; } 0 \leq x < 1$), $\text{Sn}_{1-x}\text{M}_x\text{O}_2$ ($M = \text{Hg, P, B, Si, Ge, Sb; } 0 \leq x < 1$), $\text{Sn}_3\text{O}_2(\text{OH})_2$, $\text{Sn}_{3-x}\text{M}_x\text{O}_2(\text{OH})_2$ ($M = \text{Mg, P, B, Si, Ge, Sb, As, Mn; } 0 \leq x < 3$), LiSiO_2 , SiO_2 , and LiSnO_2 . Lack of Li+ consumed in formation of a surficial film on the anode and Li+ trapped in the anode both occurring in the initial charging is supplemented by the substance.
- IT 211753-59-2, Lithium vanadium phosphate ($\text{Li}_3\text{V(PO}_4\text{)}_3$) (lithium ion supplier in **cathode**; Li secondary **batteries** with **cathodes** contg. Li metal oxide and Li+ supplier additives)
- RN 211753-59-2 HCA
- CN Lithium vanadium phosphate ($\text{Li}_3\text{V(PO}_4\text{)}_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
=====+=====+=====		
O4P	3	14265-44-2
V	1	7440-62-2
Li	3	7439-93-2

- IC ICM H01M004-02
ICS H01M004-58; H01M010-40
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST lithium **battery** **cathode** lithium ion supplier;
anode oxide lithium **battery**; tin oxide anode lithium
battery; coke anode lithium **battery**; silica anode

- lithium battery
- IT **Battery cathodes**
(Li secondary batteries with cathodes contg. Li metal oxide and Li+ supplier additives)
- IT Coke
(anode; Li secondary batteries with cathodes contg. Li metal oxide and Li+ supplier additives)
- IT **Battery anodes**
(oxide; Li secondary batteries with cathodes contg. Li metal oxide and Li+ supplier additives)
- IT 7440-44-0, Carbon, uses 7631-86-9, Silica, uses 7782-42-5, Graphite, uses 18282-10-5, Tin oxide (SnO₂) 21651-19-4, Tin oxide (SnO) 39432-42-3, Tin hydroxide oxide Sn₃(OH)₂O₂ 186448-61-3, Lithium oxide silicide (Li₂O₂Si) 211753-60-5, Lithium tin oxide (LiSnO₂)
(anode; Li secondary batteries with cathodes contg. Li metal oxide and Li+ supplier additives)
- IT 12057-17-9, Lithium manganese oxide (LiMn₂O₄) 12162-79-7, Lithium manganese oxide (LiMnO₂) 12325-84-7, Lithium nickel oxide (Li₂NiO₂) 36058-25-0, Lithium iron phosphate [Li₃Fe₂(PO₄)₃] 123550-86-7, Lithium manganese oxide (Li_{0.5}-1MnO₂) 186131-68-0, Iron lithium vanadium phosphate (FeLi₃V(PO₄)₃) 200938-46-1, Lithium manganese nickel oxide (Li₂Mn_{1.5}Ni_{0.5}O₄) 211753-57-0, Lithium vanadium oxide (Li₁₋₆VO₃) 211753-58-1, Iron lithium sulfate (Fe₂Li₃(SO₄)₃) 211753-59-2, Lithium vanadium phosphate (Li₃V(PO₄)₃)
(lithium ion supplier in cathode; Li secondary batteries with cathodes contg. Li metal oxide and Li+ supplier additives)

L57 ANSWER 9 OF 9 HCA COPYRIGHT 2002 ACS

- 128:232794 Lithium-containing, lithium-intercalating phosphates and their use as electrode material in secondary lithium-ion battery. Barker, Jeremy; Saidi, Mohamed-Yazid (Valence Technology, Inc., USA; Barker, Jeremy; Saidi, Mohamed-Yazid). PCT Int. Appl. WO 9812761 A1 19980326, 42 pp. DESIGNATED STATES: W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2. APPLICATION: WO 1997-US15544 19970904. PRIORITY: US 1996-717979 19960923.
- AB The phosphates comprise Li(3-x)MM'(PO₄)₃, where in the 1st condition x = 0, at least 1 of M and M' is a metal, and M and M' are the same or different from one another; and in the 2nd condition 0 < x .ltoreq.3 and at least 1 of M and M' has an oxidn. state higher than its oxidn. state in the 1st condition P compd. One of M and M' is selected from Mg, Ca, Cu, Co, Fe, Ni, Mo, V, Cr, Mn, and Ti. The phosphates comprise Li₃V₂(PO₄)₃, Li₃VTi(PO₄)₃, Li₃Fe₂(PO₄)₃, and Li₃FeV(PO₄)₃.

IT 204653-30-5P, Lithium vanadium phosphate ($\text{Li}_3\text{V}_2(\text{PO}_4)_3$)
 (cathode material for secondary lithium-ion
 battery)
 RN 204653-30-5 HCA
 CN Lithium vanadium phosphate ($\text{Li}_3\text{V}_2(\text{PO}_4)_3$) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O4P	3	14265-44-2
V	2	7440-62-2
Li	3	7439-93-2

IC ICM H01M004-58
 ICS H01M004-52; H01M010-40
 CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
 ST lithium intercalating phosphate **battery** electrode;
 vanadium lithium phosphate **battery** electrode; titanium
 vanadium lithium phosphate **battery** electrode; iron lithium
 phosphate **battery** electrode
 IT **Battery** electrodes
 (lithium-intercalating phosphates)
 IT 204653-30-5P, Lithium vanadium phosphate ($\text{Li}_3\text{V}_2(\text{PO}_4)_3$)
 (cathode material for secondary lithium-ion
 battery)
 IT 36058-25-0, Iron lithium phosphate ($\text{Fe}_2\text{Li}_3(\text{PO}_4)_3$) 186131-68-0,
 Iron lithium vanadium phosphate ($\text{FeLi}_3\text{V}(\text{PO}_4)_3$) 204653-31-6,
 Lithium titanium vanadium phosphate ($\text{Li}_3\text{TiV}(\text{PO}_4)_3$) 204653-32-7,
 Aluminum lithium vanadium phosphate ($\text{AlLi}_3\text{V}(\text{PO}_4)_3$) 204653-33-8,
 Chromium lithium potassium phosphate ($\text{CrLi}_3\text{K}(\text{PO}_4)_3$) 204653-34-9,
 Lithium molybdenum potassium phosphate ($\text{Li}_3\text{MoK}(\text{PO}_4)_3$)
 (electrode material for secondary lithium-ion **battery**)

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(FILE 'HCA' ENTERED AT 21:15:24 ON 29 OCT 2002)

FILE 'REGISTRY' ENTERED AT 21:28:14 ON 29 OCT 2002

FILE 'HCA' ENTERED AT 21:28:27 ON 29 OCT 2002

L58 156 S L3/P
 L59 13 S L52 AND (L14 OR L15 OR L16 OR L17 OR 52/SC,SX OR 72/SC,
 L60 0 S L59 NOT (L54 OR L55 OR L56 OR L57)